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# OPHTHALMIC DISEASES

AND

## THERAPEUTICS.

BY

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WITH NINETY ILLUSTRATIONS AND EIGHTEEN  
CHROMO-LITHOGRAPHIC FIGURES.

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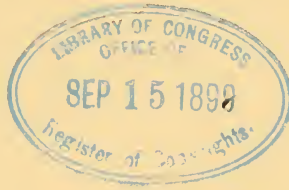
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*DEDICATION.*

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TO THE MEMORY OF MY BROTHER,

**Geo. S. Norton, M. D.,**

*Author of the Ophthalmic Therapeutics.*

THIS BOOK IS AFFECTIONATELY DEDICATED AS A TRIBUTE TO HIS  
LIFE-WORK IN OPHTHALMOLOGY.





## PREFACE TO THE SECOND EDITION.

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The indorsement extended the first edition of this book by the leading specialists of our school, as evidenced by the fact that it has been made the text-book on ophthalmology in twenty one of the twenty-two homœopathic medical colleges, and by the profession at large, as shown by its rapid sale, is extremely gratifying to the author and seems to warrant its continuance.

To bring this edition thoroughly up to date, it has been necessary, owing to the marked and rapid advancements in the domain of ophthalmology, to make very extended revisions, a number of subjects having been wholly rewritten.

The object of its inception, "to furnish the student and general practitioner with a *concise* practical manual," has been continually kept in view. In order to accomplish this end without too greatly enlarging the size of the book, many of the illustrative cases in Part II. have been stricken out; the repetition of the indications for various remedies in the different diseases has been avoided by grouping under one general heading, as, under "Indications for Remedies in Conjunctivitis" will be found the remedies for all the different varieties of conjunctivitis; by these changes much valuable space has been saved for new matter.

The remedies given under the treatment of the various diseases have been arranged, so far as possible, in the order of their most frequent use by the author, instead of alphabetically as in the first edition.

Over one hundred pages of new matter have been added covering the following subjects, viz.: The Examination of the Eye; The Use of the Ophthalmoscope; The Hygiene of the Eye, a subject of everyday practical value that has never before been written upon in any text-book of the eye; Refraction and Accommodation, two chapters that have been kindly prepared for me by Dr. Charles H. Helfrich, professor at the college of the New York Ophthalmic Hospital; A Tabulated Statement of Dis-

eases with More or Less Characteristic Eye Symptoms, a most excellent resumé of the eye in its relation to general diseases, prepared by Dr. E. H. Linnell for his valuable work, "The Eye as an Aid in General Diagnosis," and published by courtesy of the author.

Many new and original illustrations have been prepared for this edition by Dr. A. H. Hart; of these the additional plate of six chromo-lithographs illustrating external diseases of the eye is an unusual and valuable addition.

To these gentlemen, and to my assistant, Dr. Edwin S. Munson, for aid in revision of proof, the preparation of the index, etc., the author desires to acknowledge his great indebtedness.

*16 West Forty-fifth Street, New York, September, 1898.*

## FROM PREFACE TO FIRST EDITION.

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The scope of the work as originally planned has been followed out closely, and was to give as *concisely as possible* all the essential features necessary to a thorough knowledge of the diseases of the eye, commencing with sufficient anatomy of the various structures to aid in an understanding of their diseases.

In treating of the different diseases it has been our aim to follow a definite and systematic order, taking up successively the pathology, symptoms, course, causes, diagnosis, prognosis, and treatment of each separate disease.

As the object of the work has been to furnish the student and the general practitioner with a *concise*, practical manual, all useless verbiage has been discarded and the effort made to present a practical condensation of all important facts, believing such a book to be of more value to the student than one which hides the kernel under a profuse, even though interesting, envelopment.

Special attention has been devoted to the homœopathic treatment of diseases; at the same time, knowing the importance of both local and operative measures, it has been our aim to omit nothing that may be of value in these methods. The homœopathic treatment has, of course, been practically that of the last edition of the *OPHTHALMIC THERAPEUTICS*, to which several new remedies and many new symptoms of old ones have been added; on the other hand, some of the old remedies have been cut down by dropping out the reports of some of the clinical cases and occasionally some general symptom of the drug. In the revision of this department of the work all homœopathic publications of the last ten years, together with copious case records of my brother's as well as my own, have been carefully scrutinized and sifted.

*New York, August, 1892.*



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PART I.

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OPHTHALMIC DISEASES.



# OPHTHALMIC DISEASES.

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## CHAPTER I.

### Examination of the Eye.

The importance of a thorough and systematic examination, not only of the eye itself, but of co-existent general conditions, in order to determine the underlying states and to make a correct diagnosis, cannot be overestimated. Every patient should be examined systematically for both an accurate understanding of the case and for the preservation of careful records for subsequent use. The necessity of a thorough general examination varies with different cases. There is, of course, not the same necessity for an examination into the family and personal history, occupation, habits, condition of the various organs, such as heart, kidneys, nervous system, etc., etc., in cases of simple conjunctivitis as there is in the more grave ocular diseases. Furthermore, as the method of general examination or "taking the case" varies with different physicians, it will not be entered into here.

In the examination of the eye itself, we cannot emphasize too strongly the value of systematic methods. Many times has the ophthalmoscope revealed a retinitis or an optic neuritis in cases with a normal acuteness of vision, and no symptoms indicative of an intra-ocular disease. The records of a thorough examination to-day may be of the utmost value in the prognosis of some condition that may arise five, ten or twenty years later. Full records of each passing condition will often prove of great service in the treatment of subsequent similar conditions, and much of one's success in diagnosis depends upon careful routine observation and record. Therefore, we would urge, the thorough examination and the full recording of all eye cases. The author's method is in every instance to first determine the visual acuteness and any refractive error that may be present, the range and power of the ac-



commodation, and the strength and balance of the extra-ocular muscles. The appearance of the lids, lachrymal sac, conjunctiva, sclera, cornea, iris, aqueous humor and lens are carefully noted; following this, a thorough ophthalmoscopic examination of the entire fundus should be made. The examination as to the field of vision and color-perception is not necessary except in more rare instances, and is therefore only made when the previous results indicate the necessity. To avoid useless repetition, the method of determining the refraction and accommodation, the muscular balance, and the color-sense will all be detailed later on in the chapters devoted to these subjects.

**Examination of the Outer Structures.**—Much can often be learned before touching the eyes for an examination of the individual structures by noting the general appearance of the patient and of the eyes. One important factor in children which is often neglected by many physicians is to first secure their aid and confidence. A few moments spent in acquiring the child's trust and attention will give better results and save time later on. We can detect from a casual glance as the patient enters the room the presence or absence of photophobia, lachrymation and discharge from the eye—the character of the discharge, if purulent or mucus, thick or thin, bland or excoriating. A paralysis of the muscles can often be recognized by the inclination of the head, and the deviation of the eye will denote either a paralysis or strabismus. Twitchings of the lids, the face or other parts of the body will indicate nervous disorders. The expression of the face and the general physical condition are also to be noted.

*The lids* first attract our attention when we come to examine the eye proper. If swollen—whether hard and tense, or soft and œdematous—their mobility and position; their edges for distorted cilia, the presence of parasites or inflammation; their inner surface for granulations, cicatrices, secretions and foreign bodies.

To examine the inner surface of the upper lid and the superior cul-de-sac, which, as a rule, gives more characteristic indications than does the lower, and to remove foreign bodies it is frequently necessary to evert the upper lid. This procedure is quite simple after one acquires the knack or practice, but to the unaccustomed often difficult. The eyelashes of the upper lid are seized by the index finger and thumb of the left hand, the lid is then drawn



FIG. 1.



Method of examining the eye in children.

downward and away from the ball, the point of the thumb of the right hand or a pencil is then placed above the tarsal cartilage of the lid and by a quick downward pressure of the thumb and a simultaneous upward movement of the left hand grasping the cilia the edge of the lid is turned over the point of the thumb. During the entire manœuvre you must insist upon the patient's keeping the eye downward, if not the eversion of the lid becomes unnecessarily difficult and painful. When everted the thumb of the right hand presses the edge of the lid backward against the eyeball and holds it for examination.

The *lachrymal puncta* and *sac* should be examined for any obstruction, and by pressure over the sac notice whether any mucoid material or tears can be expressed from the puncta. The inspection of the *conjunctiva* shows us the presence of phlyctenules, pterygium, growths, adhesions, etc. The vascular condition of the eye affords most important information, and it should derive careful attention. Note if the redness is due to the large, tortuous, bright red superficial vessels of the conjunctiva, which are especially numerous toward the periphery and looser portion of the membrane, or if fine, radiating lines, pink in color, confined to the ciliary region and due to the episcleral vessels. The character of the congestion can be determined by gently rubbing the lower lid over the eyeball, when it will be seen that the coarser conjunctival vessels will glide over the deeper episcleral ones. In some cases we may note a leash of vessels, more or less pyramidal in shape, with the apex toward the cornea, indicative of an ulceration. Again, we may see a marked enlargement and tortuosity of the episcleral veins, pointing out a glaucoma.

The thorough examination of the conjunctiva and cornea in young children where there is much photophobia and inflammation is usually a matter of great difficulty. When, owing to these causes, there is a spasmodic contraction of the lids, their forcible separation can be best accomplished as shown in Figure 1. The nurse or attendant seated at your side lays the child across her lap with the head held firmly between the surgeon's knees. The attendant in this way can readily hold the child's hands, feet and body while the head is held as within a vise by the surgeon's knees. A towel should first be placed across the lap of the surgeon to prevent the staining of the clothes from any solutions that

may be used. The surgeon then grasps the ciliary border of the upper lid with the index finger of the right hand and with the thumb of the left hand the border of the lower lid. In opening the eye the pressure must be mainly upward toward the supra-orbital ridge and just sufficiently backward to prevent the eversion of the lid. Great care must be used *not* to make too great pressure backward or downward upon the eyeball, because in an ulceration of the cornea (which is so apt to be present in cases where this method has to be resorted to) the pressure is liable to cause a rupture of the cornea with loss of the eye. Many an eye has undoubtedly been lost through careless and severe handling in an effort to examine the same. You will often have to hold the eye open for several minutes before a clear view of the cornea can be had, as it will roll so far upwards that the cornea cannot be seen until the muscles have become tired out and allow it to resume the direct position. In some cases, when one has become especially dexterous in this manipulation, they can open the lids by the use of the thumb and index finger of the same hand, leaving the other hand free to make any necessary applications.

As the examination of the *cornea* is greatly facilitated by the use of the oblique illumination, it should always be employed. This cannot be too strongly emphasized, as we have frequently seen our students by neglect of this method overlook some minute yet important diagnostic sign which was readily discernible by its employment. Make it, therefore, a routine practice in all cases when examining the anterior part of the eye. Its use aids the minute examination of the lids and conjunctiva, as well as the cornea, iris, lens and aqueous. By it we may often determine small superficial ulcers and abrasions, commencing interstitial infiltrations, faint opacities or nebulæ, and particles of foreign substances imbedded in the cornea. The discovery of minute tears or abrasions of the corneal epithelium may be aided by the instillation of a drop of a two per cent. solution of the potassium or sodium salt of fluorescin. This should be dropped upon the cornea and followed by a washing with distilled water; any break of the epithelium will be made apparent by a deep greenish stain, which remains for about two hours.

*Oblique illumination*, or, as it is sometimes called, *focal* or *lateral illumination*, is used as shown in Fig. 2. The patient is placed two



FIG. 2.



Method of oblique illumination.





feet from the gaslight in a darkened room, as preferable to daylight, the light is then brought to a focus upon the cornea with a two or three inch lens, the surgeon may at the same time observe the surface under examination through another magnifying lens held before the eye. In order to focus the light upon the different structures, the illuminating lens will have to be moved slightly, according as the pencil of light is made to play over the cornea, iris, or lens.

Inspection of the *iris* may frequently reveal normal physiological differences in color or shade of the two irides; and we may also have instead of the uniform pigmentation one or more irregular spots of different color. We can also detect by the oblique illumination swelling, discolorations and vascularity of the iris tissue; the loss of lustre or the presence of gumma, foreign bodies, etc.; the shape and size of the pupil, the presence of adhesions to either the cornea or lens. The mobility of the iris should be carefully studied, as the pupils of the two eyes should act consensually; to examine, the patient is placed before a window in daylight and directed to look at a distance; one eye is then covered, the other exposed eye will contract to the bright light, while the covered eye acts in harmony. If both eyes be now shaded dilatation ensues, and if then again exposed to the light contraction immediately follows, succeeded in a moment by slight dilatation and again a contraction; thus oscillating for a moment it finally settles down to its original size. This action is called *hippus*, and is sometimes present in a marked degree in cases of hysteria, mania, and other nervous disorders. As the pupils contract under the influences of accommodation and convergence, care must be taken during the examination that the eyes are constantly fixed on a distant object.

*Dilatation of the pupil* occurs in glaucoma, atrophy of the optic nerve, from fright, in anæmia, nervous conditions, etc., in young people and from the use of mydriatics. According to McEwen dilatation in diseases of the nervous system, when of cerebral origin, indicates extensive lesion, and when of spinal origin irritation of the part.

*Contraction of the pupil* occurs in old people, from the use of myotics, is present in inflammation of the iris, in some fevers, in mitral disease and pulmonary congestion, and in paralysis of the sympathetic. If of cerebral origin, as in meningitis, it indicates

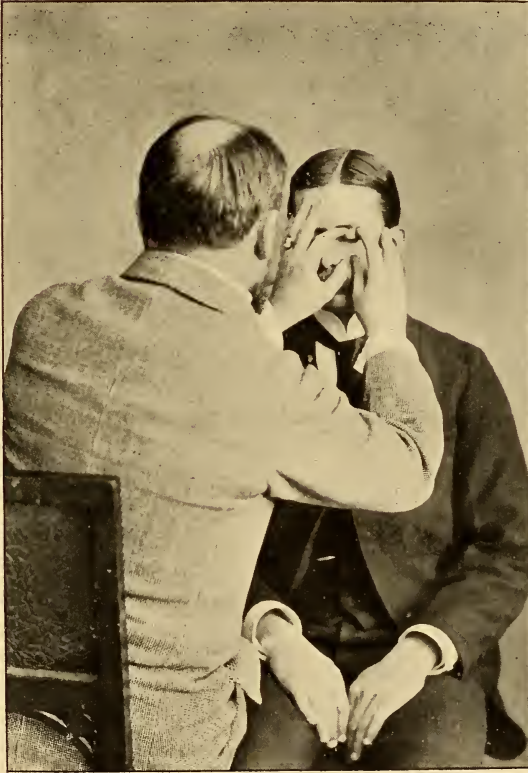
an early irritative stage of the disease; if of spinal origin, a depression, paralysis or even destruction of the part (McEwen). The Argyll-Robertson pupil is the small, contracted pupil which affected little, or none at all, by light and shade, responds by contracting still farther under the influence of convergence. This action of the pupil is found in degeneration of the posterior columns of the cord and indicates a serious central lesion.

The examination of the *anterior chamber* and *lens* also, by the aid of the oblique illumination, shows if the former is more shallow or deeper than normal, the presence of any exudation, etc., while in the lens the faintest trace of disturbance or change can be detected.

*Proptosis*, or protrusion of the eye, if unilateral, may be noted by comparing the position of the corneæ with each other and with the brows. It is present in Graves's disease, orbital diseases, intraocular tumors, paralysis of the ocular muscles, etc.

Finally the *tension* of the eye should be noted. To estimate the tension of the eyeballs the patient should be made to look downward and to gently close the eyes, for, if squeezed tightly together, that alone may slightly increase the tension. The index fingers of both hands should be applied to the lids, as there is not the same delicateness of touch between the first and second fingers of the same hand, and press gently first with one finger and then the other. The tension should always be estimated from palpation on the sclera some distance back of the cornea. Estimate according to the resistance or indentation of the globe. Tonometers, or instruments devised for estimating the tension have been employed, but are hardly practical for general use. The following signs are used for designating the degree of the tension, viz.: Tn, tension normal; T + ? or T — ?, a doubtful increase or decrease of tension; T + 1, a marked increase as compared with normal; T + 2, a greater increase, but the globe admits of some dimpling; T + 3, stony hardness, or no impression from firm pressure; T — 1, a decrease as compared with normal; T — 2, greater loss of tension, and T — 3, eye very soft, no tension at all. The tension differs physiologically in different eyes; the sclera is more elastic in young than in old people; a large eye yields more than a small one, and variations in the form of the eye affect the tension. Diseases of the sclera might increase or decrease the tension.

FIG. 3.



Method of determining the tension.



Variations in the curvature of the sclera at the point of impression will cause a slight difference in the tension, the greater the curvature the softer the eye. The tension of one eye should always be compared with its fellow, and when in doubt with an eye known to be normal, in a person of the same age as the patient.

**The Field of Vision.**—By the field of vision is meant the space, when the visual axis of one eye is fixed upon some stationary point, in which all other objects are visible. This space is large or small, in proportion to the distance at which the fixation point is from the eye. The object fixed imprints its image upon the macula lutea, while the image of all other objects fall upon some peripheral portion of the retina.

Peripheral vision is of value, in that while we only see objects indistinctly upon which the visual axis is not fixed, it attracts our attention to other objects which we may desire to see, and the eye is then turned in that direction. As, for example, in crossing a street our peripheral vision is attracted by the approach of a team within the field of vision and our attention is turned to it that we may avoid an accident. In many diseased conditions of the fundus a knowledge of the field of vision is of the greatest importance both in diagnosis and prognosis.

*The normal field of vision* varies in different directions, being greatest toward the temporal side, where it has an extent of over  $90^{\circ}$  because the rays from such a point, owing to the strong refraction at the surface of the cornea, can still enter the pupil. The field at the nasal side and above is of much less extent, because of the limitation caused by the nose and brow. The normal field for colors is found practically to be more contracted than that for white, and to vary with the different colors—blue being the least contracted, red next and green the most contracted.

*Pathological changes* in the field of vision are both numerous, varied, and, in many diseases, are quite characteristic. Alterations in the visual field may be concentric, uniformly drawn in at all points; sector-shaped, where it has the shape of a triangle whose base corresponds to the periphery; hemiopic, one-half of the field wanting; in addition to these more or less regular and frequently found forms of contraction there are many irregular shaped notches in the normal field. *Scotomata*, or blind spots in the visual field, when found as the result of disease, are classed



as central or peripheral. A central scotoma involves the point of fixation, and means that direct vision is either diminished or wholly lost. Peripheral scotoma, on the other hand, do not involve direct vision and cause but little disturbance; in fact, are often not known to the patient until found in examining the field. An annular scotoma is one that more or less completely surrounds the point of fixation like a ring, the direct vision being left intact. In the healthy eye we have a scotoma, known as Mariotte's blind spot, which corresponds to the entrance of the optic nerve and lies about  $15^{\circ}$  to the outside of the point of fixation.

*Concentric contraction* with central vision impaired, may be found in atrophy of the optic nerve or retina; with central vision good, in retinitis pigmentosa and sometimes in the early stages of glaucoma. *Sector-shaped* alterations may be found in atrophy of the optic nerve, in occlusion of one of the retinal arteries, in detachment of the retina, and in glaucoma the nasal side is contracted. *Scotomata* are found in choroiditis disseminata and other choroidal diseases, in hæmorrhages, especially when in the macula lutea, in toxic amblyopias, etc.

The importance of a careful study of the field for colors, as well as for white, is well illustrated in atrophy of the optic nerve, as in this disease the color field is more constantly involved than that for white, and in some cases will be the first sign of the disease. In glaucoma the field for colors is lost with that for white, and they bear the same concentric arrangement throughout. In toxic amblyopia there is frequently found a central scotoma for red and green.

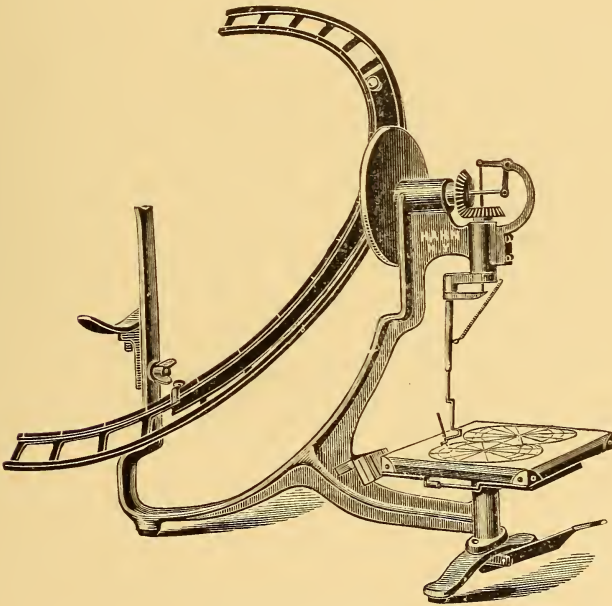
These few illustrations are merely suggestive as to the importance of perimetry in the study of intraocular and cerebral conditions, further reference to the pathological involvements of the field of vision will be found under the various diseases.

*Examination of the Field of Vision.*—This must be made for each eye separately; the eye to be examined is directed at a fixed point, as it must remain steadily in the same position, while the other eye is closed. There are three methods of determining the field of vision; the simplest, and, at the same time the poorest, is that by using the hand as a test-object. The physician stands in front of the patient, who directs his left eye to the right eye of the physician, the other eye of each being closed. The physician then

moves his hand in a plane midway between the patient and himself from the periphery inward over the limits of the field of view. The patient is to tell as soon as he sees the hand, and if his field is normal he should see the hand at the same time as does the physician. This method is only adopted to determine large defects and in those where the central vision is too poor to see smaller test-objects. The field in patients with cataract is usually tested in this way, using a candle-flame in place of the hand.

The *blackboard* is the second method of determining the field. In this the patient's head is rested on a support 30 cm. from the board. A chalk mark is made directly opposite the eye to be ex-

FIG. 4.



Skeele's perimeter.

amined, on which he is to fix his gaze. The chalk is now gradually approached from the edge to the center, and the patient tells at the moment he first sees it. By marking this spot where he first sees the chalk in all directions of the field, and then connecting the points thus determined, we have the field of vision. By using colored chalks we can determine the field for the various colors. This method is also inexact.



The only exact and scientific method of determining the field of vision is that where the projection is upon a hollow sphere. This is now determined by means of an instrument known as the *perimeter*. The patient's head is supported on a chin rest, which is so placed in front of a semi-circle that the eye to be examined is situated in the centre of the curvature of the latter. The eye is then fixed upon the middle point of the semi-circular arc, while a test-object, a small white or colored square, is carried along the arm of the semi-circle. The semi-circular arc is marked with a scale of degrees which can be read off, or in the best perimeters is self-registering on a chart attached.

## CHAPTER II.

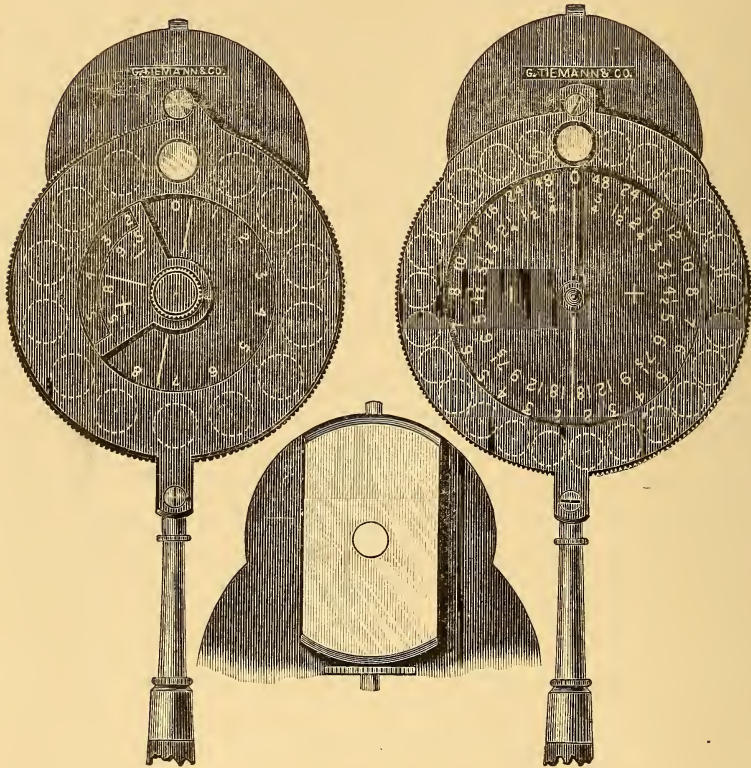
## The Use of the Ophthalmoscope.

In all the realm of modern medicine there has probably been no one discovery of greater beneficence to humanity than the invention of the ophthalmoscope by Helmholtz in 1851. Through its use the mysteries of the interior of the eye stand revealed and many conditions that previously resulted in blindness are now made remediable. With it we are able to study changes in the circulatory system, as exhibited in the retinal vessels; and in the optic nerve and retina we have, under the eye of the surgeon, direct communication with the brain and spinal system. The ophthalmoscope, therefore, has become of the greatest value in general medicine as an aid to diagnosis, for in the fundus of the eye are found many characteristic changes of disease of the various organs. Helmholtz's discovery was not a matter of chance, but resulted from a careful study of the laws of optics, one of which is that light follows the same lines in returning through a lens (in case it can return) as when entering. The rays of light returning from the eye must go direct to the luminous source from which they emanated, and in order to fall upon the retina of the observer his eye must be in the path formed by the source of the illumination and the eye under examination. The device used by Helmholtz consisted of a transparent mirror formed of three slips of plane glass. The present principle of a perforated metallic mirror was first proposed by Ruete, in 1852. In examining the interior of an eye, light is thrown into the eye by the mirror, and in order to see the fundus we must receive in our own eye the light reflected from the fundus and unite its rays to form a sharp image. The mirrors used may be either plane or concave. The concave mirror by converging the rays from the source of light gives a stronger illumination and is therefore generally used. The modern ophthalmoscope, of which Loring's is one of the best

consists then of a concave mirror, silvered on the back, for illuminating the eye and a series of lenses for measuring the refraction, and for diagnosing pathological changes by the direct method.

*The art of using the ophthalmoscope is one much more difficult*

FIG. 5.



Loring's ophthalmoscope.

to acquire than that of any other instrument of precision and is only accomplished after long and persistent practice. Every physician realizes the months or years of practice required to detect with the stethoscope the finer shades of sounds due to varying diseases of the heart and lungs. In one case the ear and

in the other the eye has to be trained by long experience before the examiner can become expert. The beginner is apt to think that after he has acquired a few details of the nerve and vessels that he can see all that is to be seen. At this stage we have often told our students that they have as yet not crossed the threshold of that vast storehouse of beautiful pictures formed by diseases within the eye. Even after years of daily use this little instrument reveals significant and often important variations of pathological states not heretofore seen, the meaning of which the observer is often at a loss to understand.

The first and most essential point in order to become a skilled ophthalmoscopist, and which is often neglected, is familiarity with the healthy fundus. The student should first practice over and over again upon every healthy eye-ground he can before attempting to study diseased states. This necessity becomes apparent from the fact that the normal fundus in health varies with the age, condition and complexion. What a large range of physiological pigmentation may be found from the negro to the albino. The *skilled* use of the ophthalmoscope is in the determination of the very slightest changes from normal, as the detection of gross pathological conditions does not present the importance that does the recognition of the incipient stages of disease.

In making an ophthalmoscopic examination artificial light is generally used and is preferable to daylight. We therefore darken the room and use a single light, the best being that from an Argand burner or a student's lamp. The eye is first illuminated from a distance of about eighteen inches, and as the light plays over the cornea we note any opacities that may be present in the cornea or lens. Occasionally when there is a marked error of the refraction the retinal blood-vessels will be seen. If the eye is highly far-sighted the vessels will move in the same direction as the head of the observer, while if it is a very near-sighted eye the vessels will move in an opposite direction.

There are two methods of examining the fundus of the eye: First, the *direct* method, so called because the eye-ground is studied by rays coming directly from it, and by this method we have an upright image; and second, the *indirect*, because the rays are received from an aerial image, or indirectly from the observed eye, and the image seen is inverted. The latter method will first



be considered because it is more frequently employed and because it is the more natural order after the preliminary examination of the cornea and lens.

*The indirect method*, or the method of examination by the *inverted image*, is made as shown in Figure 6. The patient is seated in a darkened room with the light from an Argand burner about eighteen inches behind, on the same side, and level with the eye to be examined. He should be instructed to fixate the unused eye upon some distant object. The observer sits about eighteen inches in front of the patient and holds the ophthalmoscope in the hand corresponding to the eye to be examined. A convex lens, about thirteen to eighteen diopters, is held between the thumb and forefinger of the unused hand, before the eye of the patient. By resting the middle, third and little fingers upon the outer part of the supra-orbital ridge of the patient's eye the lens is held steadily and focused upon any part of the fundus desired, and the middle finger may also be used if necessary to raise the upper lid for a better view. In all ophthalmoscopic work the student should learn to keep both eyes open, as the effort to close one eye tires the eye and prevents the complete relaxing of the accommodation. He should also accustom himself to using the right eye and holding the ophthalmoscope in the right hand when examining the right eye of the patient, and the left eye and hand when examining the left eye. The first objective point is the optic nerve head, and this is brought into view by having the patient look at the right ear of the observer, and *vice versa*, when examining the left eye, the patient should be told to look at the left ear of the surgeon. From this point he may be told to look directly at the centre of the observer's forehead, which gives a view of the macula lutea, and then, up and down, to the right and left, in order to examine all parts of the fundus. If the image of the disc when first brought into view appears dim and ill-defined, the lens and the ophthalmoscope should be moved slightly forward or backward until the image is as clear and distinct as possible. The student must always remember that by the indirect method he sees the ærial picture of the fundus and that it is inverted and reversed. The image by the indirect method is magnified about four or five times, while by the direct method we get a picture magnified about fourteen times. The extent of the field of vision

FIG. 6.



Ophthalmoscopic examination by the indirect method.







FIG. 7.



Ophthalmoscopic examination by the direct method.

on the contrary is about four times greater in the indirect than it is by the direct method. The intensity of the illumination is also greater with the indirect than with the direct, hence a view of the fundus can often be had by the indirect method when, owing to haziness of the refracting media, it is no longer visible by the direct. The indirect method gives then a larger view and better general relation of the fundus, while the direct method is particularly adapted for the recognition of the finer details.

*The direct method*, or the examination with the *erect image*, is shown in Figure 7. The patient and light are placed in the same positions as in the indirect examination. The surgeon seats himself by the side of the patient and again uses his right eye in examining the right eye of the patient, and *vice versa*. The ophthalmoscope is held in the same hand as the eye to be examined and brought up to about one inch from the eye of the patient. Both eyes are to be kept open so as to avoid as much as possible the impulse to accommodate. As the field is enlarged, and the examination by this method greatly facilitated by a dilatation of the patient's pupil, the use of a mydriatic is to be recommended to the student when first learning to use the direct method. The dilatation of the pupil can be increased also by having the room as dark as possible, by closing the other eye, and lowering the light from which the illumination is received. If a still larger pupil be required for an examination of the fundus a 4 per cent. solution of cocaine should be used, as it will give the necessary dilatation in from twenty to thirty minutes and its effect passes away in a few hours.

By the direct method, if both the eye of the observer and of the patient be normal in refraction, and the accommodation at rest in both, the details of the fundus are readily seen. If, however, either the surgeon or the patient be myopic, or if hypermetropic in excess of the power of accommodation to overcome, the refractive error must first be corrected. The power of relaxing one's accommodation comes by practice. The primary objective point in the examination is, as by the indirect method, the optic disc, and this is brought into view by having the patient look straight forward while the surgeon looks into the eye slightly from the temporal side.

**The Fundus of the Eye as Seen by the Ophthalmoscope.**—(See Figures 1 and 2, Plate II, Chromo-Lithographs.) As already mentioned, the first objective point in all examinations of the interior of the eyeball is the *optic disc*, or *papilla*. The term *papilla* is somewhat inaccurate, as the inference drawn from the word *papilla* would be that it was an elevation or something protruding from the surface of the fundus. This is not the case, as there is no prominence, and hence the term *papilla* is misleading; as, however, it is so generally employed, we shall use the word interchangeably with the more correct term *disc*. The optic nerve appears usually as a circular or slightly oval-shaped disc, but may be quite irregular in outline. Its color varies from a pinkish white to a deep red, and may vary in different parts of the disc, often paler at the centre than at the circumference, or the nasal side a more decided red than the temporal. The tint also varies with the age and complexion of the patient, and the contrast with the color of the surrounding fundus. The white appearance of some portion of the disc is due to a depression at that point, the floor of which is composed of an interlacing opaque fibrous tissue called the *lamina cribrosa*, through which the nerve fibres pass, and it is here they lose their medullary sheath and become transparent axis cylinders. This white spot, varying in size, is seen usually at the centre of the papilla, or, rarely, more at the temporal side is called the physiological cup or excavation. Care must always be taken to differentiate this physiological cupping from the excavation found in glaucoma and in optic nerve atrophy. A description of the different forms of cupping of the disc will be found under the study of glaucoma. The border of the optic disc is well defined, being sharply outlined by a double ring. The inner, or *scleral ring*, appears as a faint white streak, especially distinct in elderly people, and indicates the opening of the sclerotic coat through which the optic nerve enters the eyeball. Jaeger has called this the connective tissue ring, formed by the junction of the connective tissue elements of the inner sheath of the nerve with layers of the sclera. The outer, or *choroidal ring*, usually seen as a slight black crescent upon one side of the disc and often wholly absent, bounds the opening in the choroid.

The next most noticeable feature in the examination of the

fundus is the blood-vessels. The arterial trunk usually divides, just before emanating from the bottom of the disc, into an upward and downward branch, each of these branches generally dividing again as they pass off from the optic disc. These arteries as they spread out above and below continue to divide dichotomously into numerous branches, supplying all parts of the fundus, excepting a small area at the temporal side of the optic nerve. This area is called the *macula lutea*, or yellow spot, and at its centre is the point of most distinct vision, the *fovea centralis*. The temporal half of the retina is more freely supplied with blood-vessels than is the nasal side. The retinal veins follow the same general course and parallel to the arteries, and empty by two large branches into the centre of the disc. From this general arrangement of the retinal vessels we may have many variations in the normal fundus. The arteries and veins are distinguishable by their size and color, the veins being larger in proportion of about three to two and of a dark red as contrasted with the bright color of the arteries. The veins are also more tortuous in their course and spontaneous pulsation is not infrequently seen in the veins. The so-called *reflex* or *light streak*, which runs along the crest of the vessels, covering about one-third of their diameter, is of a pale straw color, and is more brilliant, broader and more sharply defined upon the arteries than veins and may be entirely absent in the veins. The cause of this reflex is unsettled, some claiming it to be a reflex from the vessel wall, others from the blood column.

The appearance of the *macula lutea* is as difficult to describe as it is to the student to see. No two observers seem to illustrate or describe it in the same coloring. In many cases while we examine the macular region we see nothing, and often we are but conscious of a luminous oval ring, the centre of which is marked by a small spot of a darker color. This phantom-like reflex, or, as it is sometimes called, halo, varies in size, though usually of an oval or circular shape. The inclosed space seems to be more of a grayish or brown color than the yellow we should naturally expect from the *macula lutea* being commonly spoken of as the yellow spot. The examination of the region of the *macula lutea* should always be practiced, for while in the normal eye the halo is often absent and the coloration of this spot variable, in diseased states an accurate picture of the *macula* is often



of the utmost importance. The location of the yellow spot is about one and one-half optic nerve diameters to the outer side of the disc and is usually best seen by the indirect method.

The *retina*, being a transparent membrane, is practically invisible and reveals nothing of its delicate structure excepting the retinal vessels, which are readily seen ramifying within its inner layers. Some, however, have claimed to have seen, especially in the deeply pigmented eye of the negro, with a weak illumination, the presence of the retina as a very faint grayish tinge in the neighborhood of the disc. To the observer, especially when inexperienced, the retinal vessels seem to course over and form a part of the background of the eye. They should, however, always remember that they lie some little distance in front of the underlying choroid. This can be more easily appreciated in the slightly pigmented eye, especially the albino, where they are readily seen passing over the choroidal vessels. Recognition of the *choroid* varies with the pigmentation of the eye. The bright red color from the pupil when the eye is illuminated with the ophthalmoscopic mirror arises from the choroid. The choroidal vessels appear as flat curvilinear stripes of a light pink hue interlacing in distinct meshes. The pigment stroma shows as irregular patches within the meshes of the choroidal vessels. The pigmentation is often more dense around the optic nerve and posterior part of the fundus. The visible choroidal vessels are always broader than the retinal trunks, and no distinction can be made between the arteries and veins.

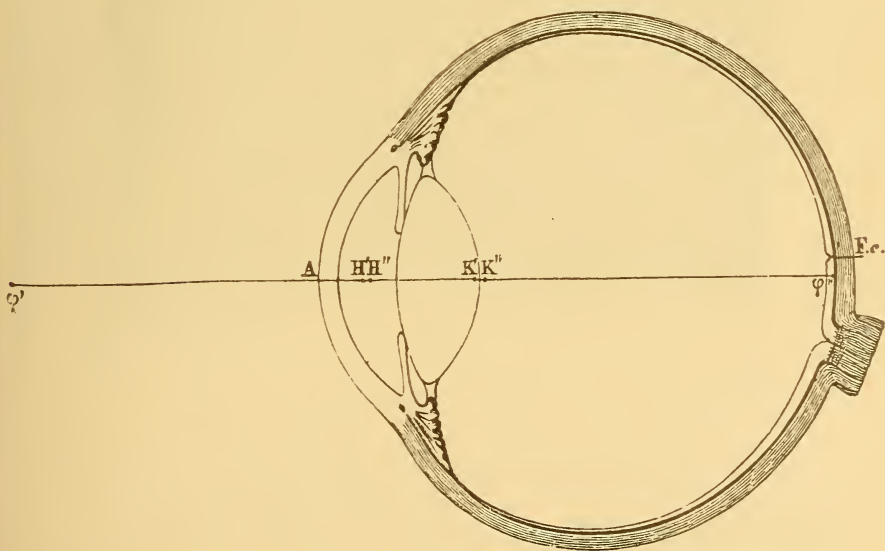
## CHAPTER III.

## Refraction and Accommodation of the Eye.

By CHAS. H. HELFRICH, M. D., Surgeon to the N. Y. Ophthalmic Hospital.

**Normal Refraction and Accommodation.**—The dioptric media of a normal or emmetropic eye (cornea, aqueous humor, lens and vitreous humor) have the requisite refractive power to bring parallel rays of light to a focus on the layer of rods and cones of the retina. These media are centered on the optic axis, a line passing through the centre of the cornea and the posterior pole of the eye.

FIG. 8.



Schematic eye.  $\Phi'$ , anterior or first principal focus; A, anterior surface of the cornea;  $H'$  and  $H''$ , principal points;  $K'$  and  $K''$ , nodal points;  $\Phi''$ , posterior or second principal focus; F.c., fovea centralis;  $\Phi'\Phi''$ , optic axis.

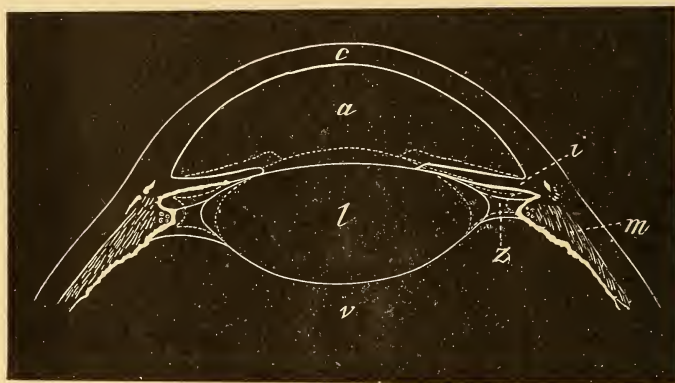


Upon the optic axis are situated the *cardinal points* of the dioptric system.

Objects situated at a distance of five metres or more are considered as being at infinity, because those rays from them which enter an eye are so slightly divergent that for practical purposes they may be considered parallel. As parallel rays are brought to a focus at the second principal focus, the eye is capable of forming distinct inverted images of distant objects upon the retina.

The eye, however, can also see near objects distinctly, and as the rays from such sources become more divergent the nearer they approach, it is obvious that it must contain some mechanism to increase its refractive power. The power by which it is increased so that divergent rays are also brought to a focus on the retina is the accommodation.

FIG. 9.



Changes in the eye produced by accommodation. *c*, cornea; *a*, anterior chamber; *l*, lens; *v*, vitreous humor; *i*, iris; *z*, zonula of Zinn; *m*, ciliary muscle.

By the term *static refraction* is meant the power the eye has when at rest (without an effort of accommodation) to bring parallel rays of light to a focus on the retina or to render divergent rays less divergent.

The *dynamic refraction* constitutes the increase of refractive power produced by the effort of accommodation.

THE MECHANISM OF ACCOMMODATION is as follows: By con-

tracting the ciliary muscle the tension on the zonula of Zinn is relaxed, permitting the lens to become more convex through its own elasticity, and thus increasing the refractive power.

The changes which take place in accommodation are represented by the dotted lines in (Fig. 9.)

The anterior surface of the lens advances and becomes more convex, while the convexity of its posterior surface increases but little and does not change its position at all. Associated with this act is a contraction of the pupil.

THE FAR AND NEAR POINTS.—The name *punctum remotum*, or far point, is given to the point to which the eye is adapted when at rest. It represents the most distant point of distinct vision, and is designated by R. By the term *punctum proximum* or near point, is understood the nearest point of distinct vision. It is found by ascertaining the nearest point at which the smallest test-letters can be read, and is designated by P. It is possible for the eye to see all objects distinctly between these two points.

THE RANGE OR AMPLITUDE OF ACCOMMODATION is the amount of accommodative effort of which an eye is capable, and is equal to the difference in the refractive power when in a state of rest and when its accommodation is exerted to the utmost. It may be represented by that convex lens, placed in front of an eye, which would give to rays coming from the near point a direction as if they came from the far point. If we consider  $a$  equals the number of dioptries represented by the range of accommodation,  $p$  the number of dioptries represented by the eye when adapted to its near point, and  $r$  the number of dioptries represented by the eye when adapted to its far point, we can calculate the amplitude of accommodation by the following formula:—

$$a = p - r.$$

In the emmetropic eye  $R$  is at infinity, therefore  $r = 0$ ; hence  $a = p$ . To illustrate, when the near point is 20 cm. (a focal length of 20 cm. represents a lens of 5. D) from the eye, we have  $a = 5. D$ .

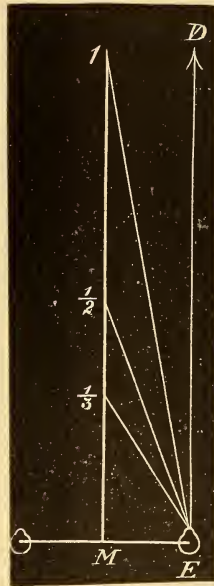
In myopia  $R$  is at a fixed distance, and, for example, if it is situated at 50 cm. (myopia of 2. D) and  $P$  at 20 cm. (5. D) we have  $a = 5. D. - 2. D. = 3. D$ .

The hyperopic eye is adapted for rays which converge to a point behind the retina, therefore  $r$  is negative and must be added to  $p$ . In this case we have  $a = p - (-r)$  and reduced  $a = p + r$ . To illus-

trate, if the hyperopia is  $10. D.$  and  $P$  is situated at  $20 \text{ cm.}$ , we have  $a = 5. D. + 10. D. = 15. D.$

CONVERGENCE. — Ordinarily man looks simultaneously with both eyes, yet appreciates but a single image. This union in one single impression of the retinal images received by both eyes is called binocular vision. In order to obtain this each eye must receive upon its fovea centralis a distinct image of the object, and hence it is necessary that both lines of fixation (a line connecting the object of fixation with the centre of rotation) be directed towards the object looked at. When looking at a distant object the lines of fixation are parallel, but the nearer it approaches the more the lines of fixation must converge and the eyes turn in. If an object is moved along the median line (I M, Fig. 10), a line

FIG. 10.



The metre angle.

perpendicular to the middle of a line uniting the centres of rotation, both eyes converge equally to any given situation. The degree of convergence is measured by the angle through which an eye turns when it fixes the object. When it is situated at I, one metre distant from the eye, the angle of convergence E I M

is one metre angle which is taken as a unit. If the object be situated at  $\frac{1}{2}$  of a metre, it is obvious that the angle of convergence is twice as large as in the former instance; that is, it equals 2 metre angles.

ACCOMMODATION AND CONVERGENCE ASSOCIATED.—With every degree of convergence is associated a certain effort of the accommodation. When looking at an object situated at one metre, it is necessary to converge 1 metre angle, and an effort of the accommodation equal to a convex lens of  $r. D$  must be employed. That is, the refraction and convergence must increase by an equal quantity, which is the inverse of the distance of the object.

This association between accommodation and convergence, however, is not absolute, for with the lines of fixation fixed on a given point and stationary, the accommodation can be somewhat increased and diminished; and conversely, with a given amount of accommodation, the degree of convergence can be augmented and reduced.

If an object is held at one metre and first weak convex and then weak concave glasses be placed before the eyes the distinctness of the image is unaltered. The *relative amplitude of accommodation* is thus obtained. The part represented by the strongest convex glass which can be placed before the eye without affecting the distinctness of the object is termed the negative, and the part represented by the strongest concave glass the positive. When sustained efforts of the accommodation are necessary at any distance, it is essential that the positive relative amplitude of accommodation be considerable.

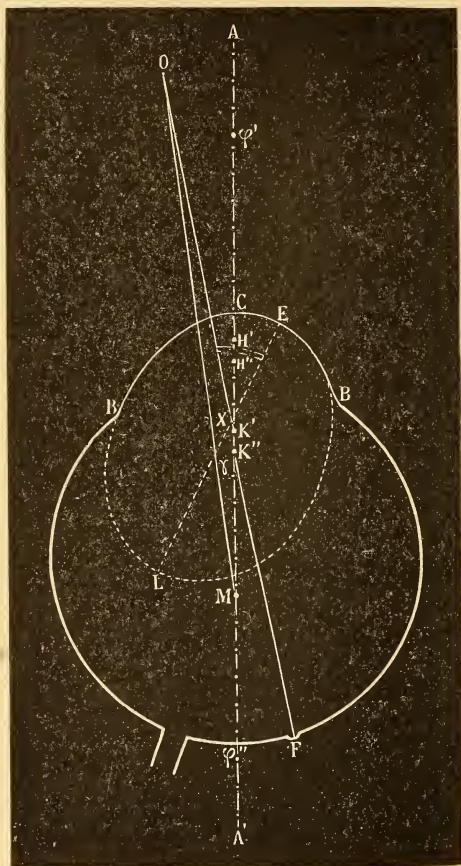
That the convergence may be altered while the same effort of accommodation is maintained can be demonstrated by placing a weak prism with its base in before one eye. If the convergence remained unaltered, the prism would cause double vision, but the eyes rotate outward and the object looked at is still distinct and the image single. Likewise, it will be found that a weak prism with its base out will be followed by a rotation of the eye inward with no effect on the distinctness of the image. The *relative amplitude of convergence* is thus obtained.

THE ANGLE ALPHA AND ANGLE GAMMA.—The optic axis  $A A'$  (Fig. 11.) is an imaginary line, which may be regarded as passing through the centre of the cornea  $C$  and the posterior pole of



the eye — a point situated between the fovea and the optic papilla. Upon it are the cardinal points and the centre of rotation  $M$ .

FIG. II.



Schematic figure showing the angles  $a$  and  $\gamma$ .  $AA'$ , optic axis;  $\Phi'$ , anterior focus;  $\Phi''$ , posterior focus;  $H'H''$ , principal points;  $K'K''$ , nodal points;  $M$ , center of rotation;  $C$ , centre of cornea;  $BB$ , base of the cornea;  $EL$ , major axis of the corneal ellipsoid;  $F$ , fovea centralis;  $O$ , point of fixation;  $K'O$ , line of vision;  $MO$ , line of fixation;  $OXE$ , angle  $a$ ;  $OMA$ , angle  $\gamma$ .

This visual line  $OF$  unites the point of fixation  $O$ —the object looked at—with the fovea. It does not coincide with the optic axis, but crosses it at the nodal points.

The line of fixation  $OM$  joins the centre of rotation with the point of fixation.

If the fovea coincided with the posterior pole, the visual line, line of fixation and optic axis would also coincide, but this is not the case.

The apex of the corneal ellipsoid  $E$  does not coincide with the centre of the cornea, and therefore neither does the major axis of the ellipse  $EL$  coincide with the optic axis.

The angle  $OXE$  formed by the visual line and the major axis of the corneal ellipse is called the angle alpha.

When the anterior portion of the corneal axis is situated to the temporal side of the line of vision, the angle  $\alpha$  is called positive; when it is situated to the nasal side, negative.

The angle  $OMA$  formed by the line of fixation with the optic axis is called the angle gamma.

It is termed positive when the anterior extremity of the line of fixation passes to the inner side of the optic axis, and negative when it passes to the outer side.

In practice, it is usual to consider the line of fixation and the visual line as indential.

In order to measure the angle gamma, the patient is placed before the perimeter as for an examination of the field of vision. A lighted candle is moved along the arc of the perimeter, and by means of the corneal reflection of the flame the centre of the cornea is found. The position of the candle at the perimeter is now read from the arc in degrees and represents the size of the angle. Its average size is five degrees.

In emmetropia and hyperopia the visual line cuts the cornea to the inside of its major axis, and the angle gamma is therefore positive. Owing to the shortness of the eyeball in hyperopia, the effect of which is to increase the distance between the fovea and the optic axis, the angle gamma is very much greater than in emmetropia. This may give to the eyes the appearance of an apparent divergent strabismus, as the axes of the corneæ seem to diverge though the fixation is correct.

In myopia the length of the eyeball is too great, so the visual line cuts the cornea nearer the major axis, or they may coincide, or it may cut it to the outer side making the angle gamma negative. In the latter case the effect will be to give the eyes the appearance of an apparent convergent strabismus.

**Abnormalities of Refraction and Accommodation.**—As has been explained in the preceding pages, a normal or emmetropic eye is one whose static refraction is sufficient to bring parallel rays to a focus on the retina; or, one whose retina is situated at the focus of its dioptric system. Its far point is always at infinity. Any departure from emmetropia is known as ametropia of which three different forms are recognized: 1. Hypermetropia, in which the retina is situated in front of the focus of parallel rays. 2. Myopia, in which the retina is situated behind the focus of parallel rays. 3. Astigmatism, in which the refraction of the different meridians is different.

**Hypermetropia or Hyperopia.**—In hyperopia the static refraction is not sufficient to bring parallel rays to a focus on the retina. Such rays if not intercepted by the retina would come to a focus behind it. As they are intercepted by the retina they do not form there a distinct image of the object looked at but a circle of diffusion. In order to bring parallel rays to a focus on the retina, it is necessary either to place an appropriate convex lens before the eye which causes them to converge or to call the accommodation into play.

Fig. 12 shows how the parallel rays  $a b$  converge toward a point  $c$ , behind the retina, after passing through the dioptric system; and how the diffusion circle  $d e$  is formed upon the retina.

FIG. 12.



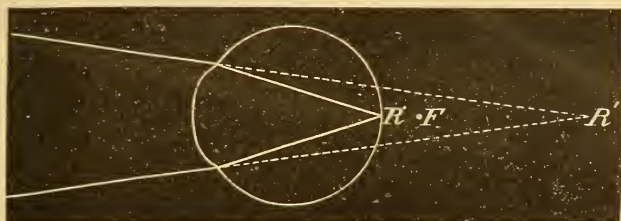
Formation of diffusion circles on the retina in hyperopia.

As the retina in hyperopia is nearer the dioptric system than its principal focus, rays passing out from any point upon it such as  $R$  (Fig. 13) will leave the eye divergent and will appear to come from a point  $R'$  situated behind the eye.

The point  $R'$ , the virtual conjugate focus of  $R$ , is the far point



FIG. 13.



Far point of a hyperopic eye.

of the eye, or the point towards which the rays must converge before entering in order to be brought to a focus on the retina. Being behind the eye it is negative. In order that parallel rays may be brought to a focus on the retina, it is necessary that the refractive power of the eye be increased by such a lens as will render them convergent towards the point  $R'$ . This is shown in Fig. 14 where the lens  $L$  renders the parallel rays convergent towards  $R'$ , and which the dioptric system render still more convergent so that they come to a focus at  $R$  on the retina.

FIG. 14.



Correction of hyperopia by a convex lens.

The greater the hyperopia the nearer the far point is to the eye, the more convergent the rays must be in order to come to a focus on the retina, and the stronger must be the lens which renders them so. But the power of accommodation is also sufficient to increase the static refraction sufficiently to bring parallel rays to a focus on the retina if the degree of hyperopia is not too great. In fact, it ordinarily does so in such cases so that the vision may

be normal for distant objects, which has given rise to the misleading term of farsightedness. A beginner might fall into the error of considering such an eye emmetropic; but it can be proven to be hyperopic by successively placing stronger and stronger convex glasses before it, which, as the accommodation relaxes, do not interfere with the distinctness of the object until the hyperopia is overcorrected, or an artificial myopia is produced. Hence, it is necessary to find the *strongest convex glass* through which the hyperopic eye can see distant objects most distinctly in order to find the measure of the error. Generally the ciliary muscle, through force of habit, does not relax to its fullest extent, so that the strongest convex glass simply represents the amount of *manifest* hyperopia (Hm). The balance of it, the *latent* (Hl), can only be made manifest by instilling a solution of some cycloplegic like atropine which suspends the accommodation.

The sum of the latent and manifest hyperopia gives the *total* (Ht). Theoretically, that glass placed in contact with the eye whose focal distance is equal to the distance of the far point behind the eye, or which renders parallel rays convergent towards the far point, is the measure of the hyperopia. In practice, however, the glass is placed about 15 mm. in front of the eye, and it is regarded as the measure, though in reality it is not as great.

CAUSES.—The eyeball is either abnormally short, constituting *axial hyperopia*, or its refractive power may be deficient, *curvature hyperopia*. Hyperopia is nearly always congenital. Most children are so at birth, but as they grow older the refraction increases and they become less hyperopic, or emmetropic, or myopic. Senile changes in the lens, flattening, give rise to it; and its removal, as for cataract, produces a high degree. The latter condition, however, is termed aphakia.

SYMPTOMS.—The constant effort of the accommodation necessary in order to see distinctly gives rise to many symptoms. As the ciliary muscle tires, vision blurs, and it is necessary to stop work and rub the eyes. The respite obtained in this way is only temporary, as the muscle soon tires again and the performance must be repeated again and again until finally the work must be discontinued. Such people often seek a good light because the contraction of the pupil renders the vision

clearer. Frequently too they hold the object near the face to secure larger retinal images and contract the lids to shut off the more divergent rays. This gives the semblance of myopia, and many children are erroneously given concave glasses which aggravate the trouble.

When left uncorrected, hyperopia frequently gives rise to conjunctivitis, blepharitis, nictitation of the lids, and congestion of the retina, choroid and optic nerve. Headaches and various reflex neuroses are very common.

Strabismus convergens is frequently associated with hyperopia the discussion of which will be found in the chapter upon that subject.

Hyperopia is often complicated with spasm of the ciliary muscle, the effect of which is to bring nearly or wholly the entire accommodation into play. This reduces the amount of manifest hyperopia when it is of high degree, and in some instances may even convert the case into one of false myopia. The vision in the latter instance will be improved by concave glasses, though it would be a serious error to prescribe them. Such a mistake is prevented by detecting the real nature of the refractive error by means of the ophthalmoscope, as described in the chapter on dipotometry.

When spasm of the accommodation is present, it is imperative that a cycloplegic be instilled to temporarily paralyze the ciliary muscle and so suspend the accommodation.

Manifest hyperopia is divided into *facultative*, *relative*, and *absolute*.

Facultative hyperopia may be overcome by using the accommodation without squinting.

Relative hyperopia represents a greater degree, and can only be overcome by the accommodation when the patient squints inward.

Absolute hyperopia is the highest degree, and cannot be overcome by using the entire accommodation.

The determination of hyperopia will be described in the chapter on dioptrics.

**CORRECTION OF HYPEROPIA.**—If the patient has normal acuteness of vision and no asthenopic symptoms glasses need not be prescribed for him.

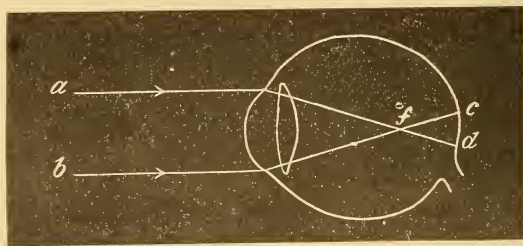
When distant vision is imperfect, and asthenopic symptoms are present, it is necessary to prescribe glasses which represent the amount of manifest trouble, either for constant use or for near work. In some instances, it may be necessary to correct the manifest and part of the latent if the latter exists. As a rule, if hyperopia is associated with exophoria it is best to prescribe as weak a convex glass as possible, whereas if esophoria is present, the strongest. In spasm of the accommodation it is advisable to put on nearly the entire correction while the eye is under the influence of the cycloplegic, and later glasses which correct all the manifest and as much of the latent as is tolerated.

Many cases of convergent strabismus in children are cured by prescribing appropriate glasses. The degree of hyperopia can be determined by the direct examination with the ophthalmoscope or skiascopy if the child is too young to know its letters.

**Myopia.**—In this form of ametropia parallel rays of light are brought to a focus in front of the retina, therefore the latter is situated beyond the principal focus.

The focus of the rays  $a b$  (Fig. 15) is at  $f$  where they cross each other, and on arriving at the retina form the diffusion circle  $c d$ .

FIG. 15.



Formation of diffusion circles on the retina in myopia.

As the retina is situated behind the principal focus, rays coming from any point upon it such as  $c$  (Fig. 16) leave the eye convergent and meet at a point  $r$  in front of it.

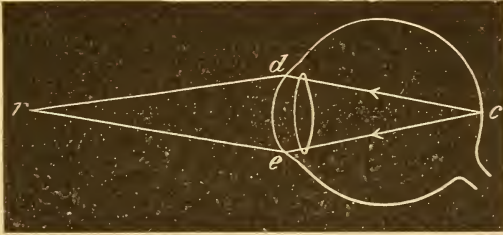
The points  $c$  and  $r$  are conjugate foci, for if the rays coming from  $r$  enter the eye its dioptric system will bring them to a focus at  $c$ . For this reason  $r$  is the far point of the eye, as it is the most distant point of distinct vision. A myopic eye is adapted for



divergent rays of light, therefore if a distant object is brought nearer it can be seen distinctly when it arrives at the far point.

In order that a myopic eye may be able to see objects at infinity, it is necessary that parallel rays be given a divergence as if they came from its far point. This can be accomplished by a concave

FIG. 16.



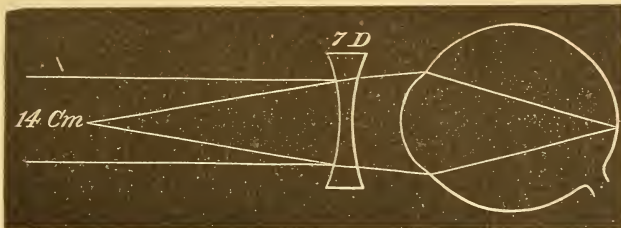
Far point of a myopic eye.

lens whose focal distance coincides with the distance of the far point from the eye. Such a glass placed in contact with the cornea would represent theoretically the degree of myopia.

In practice, however, the glass is placed about 15 mm. in front of the cornea, and is somewhat stronger than the theoretical degree.

The effect of a concave glass rendering parallel rays divergent as if they came from the far point is shown in (Fig. 17.)

FIG. 17.



Correction of myopia with a concave lens.

The divergence given to parallel rays by a weak concave glass can be overcome by an effort of the accommodation, and this is of

importance in testing for myopia. It makes it essential to select the *weakest concave glass* that renders distant vision most distinct. Spasm of the accommodation is also frequently present in myopia, rendering the instillation of a cycloplegic necessary. In fact, it is generally the best plan, everything else being equal, to test myopic eyes with the accommodation paralyzed in order to prevent the very serious mistake of prescribing too strong concave glasses.

CAUSES.—Myopia is most frequently due to an increased length of the axis of the eyeball, *axial myopia*; but may be due to an abnormally high refractive power, *curvature myopia*. It is rarely congenital, but comes on about the eighth year and is very prone to increase.

Its progressive increase is encouraged by use of the eyes at near work, such as reading, writing, drawing, sewing, etc., but the essential connection between such work and the lengthening of the eyeball is still problematical. Children, when reading and writing, bend their heads forward to bring them close to the books. In such a position the visual plane is lowered, the ciliary muscle is kept tense, and the eyes are made strongly convergent.

On account of the excessive convergence the recti are rendered tense; and, owing to the lowering of the visual field, the obliqui also. The pressure of these muscles, augmented by the ciliary, increases the internal tension of the eye. The tension is further augmented by the hyperæmia due to the work itself and the interference with the return of venous blood induced by bending the head forward. It is presumed that the increased tension causes the envelopes of the eye to yield, but it is certain that there must be some predisposing causes as well. While myopia is more apt to come on during school life, and is more prevalent among the upper classes and in artisans whose work demands close inspection, the reverse is frequently true. All school children working under the same conditions do not become myopic, and many high degrees of myopia are found in people in the lower walks of life who do not use their eyes for close work.

In cases of commencing cataract, a weak degree of myopia often sets in as the result of the changes in the lens which cause an increase in its refractive power.

Conical cornea gives rise to myopia by the increase of the



curvature of the cornea and the lengthening of the axis of the eyeball.

**SYMPTOMS.**—Subjective symptoms are not as common as in hyperopia. The most common are headaches, aching of the eyeballs, burning of the lids, floating specks and congestion of the conjunctiva. Myopes ordinarily half close the lids when viewing distant objects and hold small objects quite close to the eyes.

The most pronounced objective symptoms are found when progressive myopia becomes complicated with organic disease.

Posterior staphyloma, recognized by the ophthalmoscope as a white crescentic patch at the outer side of the optic papilla, is found in nearly all myopic eyes. It is caused by the increased tension which results in atrophy of the choroid at this point, permitting the white sclerotic to be seen. In extreme cases it may become annular and extend all around the optic papilla.

Often it is possible to distinguish between a stationary and a progressive myopia by the edge of the staphyloma, which if clear cut, usually denotes it to be stationary. Conversely, if it extends towards the macula and is irregular it is more likely to be progressive.

More serious and frequent complications of progressive myopia are choroidal degeneration and hæmorrhages in the neighborhood of the yellow spot, detachment of the retina and opacities in the vitreous humor.

Divergent squint and exophoria are frequently associated with myopia.

**TREATMENT.**—On account of the ability of myopes to see fine objects so distinctly when held near to the eyes, they are popularly supposed to have strong eyes. From what has been said it is easy to appreciate what a serious mistake this is.

Owing to the progressive character of the trouble its management is a most important task, especially during the school life of children. Many cases are stationary and need cause no anxiety, but those which are progressive demand special care. In order to prevent the necessity of too great convergence, these patients should occupy themselves with large objects which need not be held so close to the eyes.

A proper position at the desk is necessary with the book on a slope and the head upright. The desk should be so placed that

a good light comes over the shoulder, and it should not be too low. It is essential that the number of working hours be restricted and that frequent short rests be taken. Proper exercise in the open air is also advisable. When the more serious complications are present, complete rest of the eyes with suspension of the accommodation by atropine is to be ordered. During this time smoked glasses should be worn.

The correction by suitable glasses is an important part of the treatment of myopia. Very weak degrees of myopia in young people with good amplitude of accommodation may be fully corrected by glasses to be worn constantly, but if it amounts to more than say 2. *D.*, weaker glasses for reading are required in addition. In higher degrees, providing the vision is good, nearly the full correction for distance can be worn, but a separate glass for reading should be given. Such cases should be warned not to use their distance glasses for near work. The proper near glass is one that will permit the patient to read at about 30 cm., at which distance the convergence is not excessive. Such a glass can always be found by deducting from the distance glass the lens whose focal length is equal to 30 cm. This lens is 3.25 *D.*

In like manner proper glasses for the special distance, at which painting and piano playing are carried on can be calculated.

Patients whose acuteness of vision is much reduced are prone to hold their work nearer than 30 cm. in order to obtain larger retinal images. If so, the near glasses must be still further reduced or taken away entirely.

Since Fukala recommended extraction of the lens for extreme degrees of myopia the operation has been taken up by a number of German surgeons and lately by some in the United States. The operation consists first in making a discission of the lens, and later when it has become swollen and cataractous it is removed through a linear incision. Jackson calculates that a myopia corrected by a lens of from 17 to 18 dioptries will be followed by emmetropia upon extracting the lens of the eye, and a gain in the size of the retinal image of about 55 per cent. As the dangers are comparatively insignificant and the advantages great, the operation is no doubt destined to play an important part in the management of myopia of more than 15. *D.*

Swanzy operates only upon one eye, thereby improving the

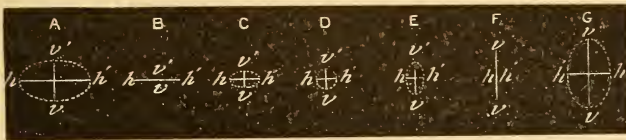
vision in it for distant objects, leaving the unoperated eye better adapted for near work. His method is to make repeated discissions until the lens is absorbed, and does not extract unless glaucoma supervenes.

**Astigmatism or Astigmia.**—In discussing hyperopia and myopia, the cornea has been considered as an ellipsoid of revolution, so that planes passing through it produce sections having an equal curvature, the effect of which is to bring all rays emanating from a luminous point to a single focus. But there is also a form of eye in which all the rays of light are not brought to a focus at a single point, because the refractive power is not the same in all its meridians, or in the various sections of the same meridian.

In astigmatism, those rays of light which enter in the direction of the greater curvature form their focus first and at a point nearer the dioptric system than those which enter in the direction of a meridian of less curvature. Homocentric light is therefore brought to a focus at several points instead of one.

Astigmatism is divided into *regular* and *irregular*.

FIG 18.



Refraction of the rays in regular astigmatism.

In regular astigmatism the curvature of the cornea is greater in one meridian than in another, whereas in irregular astigmatism the curvature varies in the different sectors of the same meridian.

Regular astigmatism is divided into *simple hyperopic*, *compound hyperopic*, *simple myopic*, *compound myopic* and *mixed*.

The meridians of maximum and minimum curvatures are always at right angles to each other, and most usually are the vertical and horizontal. They are known as the *principal meridians*, the vertical being generally that of the greatest curvature. The intermediate meridians between the principal meridians are of regularly intermediate refracting power. The

effect on a pencil of rays passing through an astigmatic eye whose vertical meridian is that of the greatest curvature is shown in Fig. 18 by various sections supposed to be thrown on a screen placed at varying distances from the cornea.

Remembering that the rays passing through the vertical meridian are most sharply refracted, we have at *A*, not a round section, but a horizontal oval. At *B* the rays passing through the vertical meridian have come to a point, and those from the horizontal meridian form a horizontal line. Beyond this, the vertical rays diverge, having crossed at the focus, while the horizontal diffusion decreases, giving rise to the section at *C*, and later, when the two are equal, a circle as at *D*. The figure next becomes a vertical oval, as at *E* and later, when the horizontal rays come to a focus, a vertical line at *F*. Finally a vertical oval as at *G*.

The interval between the foci of the two principal meridians is called the *focal interval of Sturm*.

The position of the retina with reference to the two principal foci designates the kind of astigmatism. Thus in simple hyperopic astigmatism one focus is situated upon the retina and the other behind; in compound hyperopic both are behind; in simple myopic one is situated upon and the other in front; in compound myopic both are in front; in mixed one in front and the other behind.

CAUSES—The seat of astigmatism is usually the cornea but it may also be present in the lens, and when this is the case it may neutralize some of the corneal astigmatism. Sometimes, however, it augments it. Lentil astigmatism is often compensatory and is produced by localized contractions of the ciliary muscle. Astigmatism may also be produced by an oblique position of the lens. Operations upon the cornea frequently produce it by the contraction of the cicatrix formed by the healing of the incision.

SYMPTOMS—From what has been said it will be easy to understand the difficulties under which an astigmatic individual labors in appreciating horizontal or vertical lines, depending upon the kind of astigmatism present. As letter-press is composed for the most part of horizontal and vertical lines, and as the astigmatic eye is unable to clearly recognize at the same moment both kinds of lines in the same plane, considerable difficulty in reading letters is



experienced because the circles of diffusion which form in one direction cover the distinct images which are formed in the other.

If parallel rays from a point enter an eye which is emmetropic in the vertical meridian and hyperopic in the horizontal, those rays which enter the former meridian will focus at a point on the retina, while those which enter the latter will form horizontal diffusion lines at either side. As a line is made up of an infinite number of points such an eye would appreciate horizontal lines much clearer than vertical ones, because the lines of diffusion would not materially affect horizontal lines except to elongate them.

These facts are utilized in the diagnosis of astigmatism by the use of the ordinary "clock face" test-type.

They also explain why astigmatic persons often partly close their eyelids to shut out the rays from one meridian and incline their heads to one side or the other to bring the other principal meridian to correspond to the slit-like palpebral opening. For like reasons a stenopaic slit improves the vision of astigmatic individuals.

Persons with hyperopic astigmatism frequently bring objects at which they may be looking very near their eyes to increase the visual angle. Astigmatism is the cause of a very large percentage of headaches and gives rise to a number of nervous troubles of a reflex nature. Chorea and epilepsy have been cured by correcting it with proper glasses.

Frequently the weaker degrees give rise to more of these troubles than the higher, owing to the constant efforts of the ciliary muscle to overcome the error.

The presence of astigmatism can often be determined by the ophthalmoscopic appearance. An observer has difficulty in seeing both vertical and horizontal vessels simultaneously, and must alter his accommodation to see first one and then the other. The optic papilla, instead of being circular, appears oval. In the direct examination the long axis corresponds to the meridian of greatest curvature and in the indirect to the least.

**TREATMENT.**—As spherical lenses refract light equally in all meridians, it is evident that they cannot correct the differences in the refractive powers of the two principal meridians in astigmatism. This can only be corrected by cylindrical lenses, which are sections

of cylinders parallel to their axes. Such lenses refract light in one direction only, viz., that at right angles to their axes. Thus simple hyperopic and myopic astigmatism, where one meridian is emmetropic and the other hyperopic or myopic, are corrected by convex or concave cylinders with their axes corresponding to the emmetropic meridian.

Cases of compound hyperopic and compound myopic astigmatism, where both foci are either behind or in front of the retina, are corrected by convex or concave sphericals which render one meridian emmetropic and partially correct the other, combined with convex or concave cylinders which correct the remainder.

Mixed astigmatism, where the retina is situated between the two foci, requires a combination of a convex and a concave cylinder placed at right angles to each other which set back one focus and advance the other.

A variety of combinations of spherical with cylindrical lenses is possible which are optical equivalents.

In testing the compound forms of astigmatism, it is the rule to correct as much as possible with spherical lenses and the balance with cylinders.

As in simple myopia and hyperopia, the weakest concave and the strongest convex glasses which render distant vision most distinct represent the degree of the error. In prescribing glasses, it is the general rule to fully correct the astigmatism with cylinders, but the sphericals may be weakened to suit the accommodation. The general rules governing their selection in hyperopia and myopia apply in astigmatism. In simple hyperopic or myopic astigmatism, the strongest convex and weakest concave cylinders which improve distant vision most are selected. In compound hyperopic the spherical may be weakened, and in compound myopic this is frequently necessary, especially for near work.

Mixed astigmatism ordinarily receives the full correction. As a general rule, all cases of astigmatism ought to be thoroughly tested with the accommodation paralyzed.

**Irregular Astigmatism.**—A low degree of this defect occurs in the majority of eyes. This is often more manifest when the pupil is dilated, or when the eye is being tested under atropine. It will be found impossible to bring the vision up to what it was before the mydriatic was instilled.



Higher degrees reduce the vision very much. The stenopaic hole increases vision, but such spectacles are impracticable on account of their small field. Sometimes one meridian of regular curvature can be found, and, if so, the vision is benefited, by means of a cylindrical lens, which can be prescribed. Irregular astigmatism is frequently produced by the cicatrices of ulcers of the cornea. The congenital form is due to irregular refracting power in different parts of the lens.

**Anisometropia.**—By this term is meant a difference in the refraction of the two eyes, one being more hyperopic or myopic than its fellow, or a different form of ametropia existing in each eye.

When the difference is slight, it is usually possible to fully correct each eye. When the difference is considerable, an attempt may be made to do so, but if it is impossible the stronger glass should be weakened. Sometimes the choice of eyes to be corrected lies with the vision, the best eye receiving the proper correction. Again, it may be advisable to correct one for distance and the other for near.

Each case is usually a law unto itself, and should be dealt with accordingly. The difficulties are usually due to the absence of binocular vision and the prismatic effects of the correcting lenses.

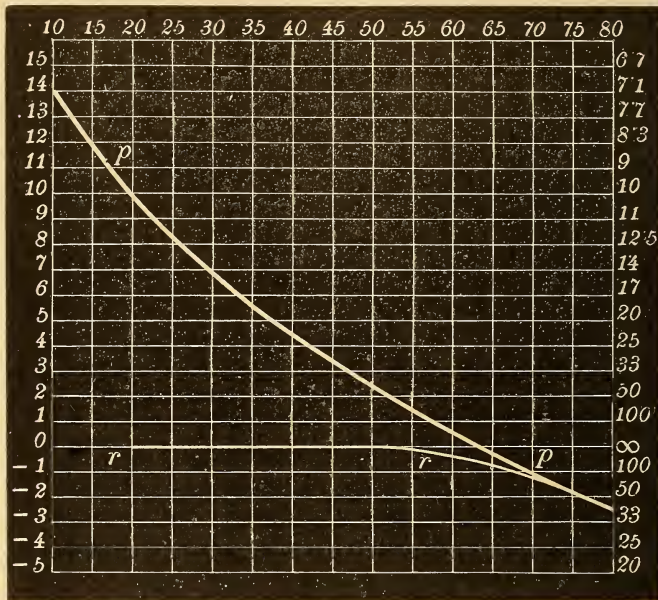
**Presbyopia.**—There is a diminution in the amplitude of accommodation, which, commencing at an early age, progresses with advancing years. It is caused chiefly by a progressive loss of elasticity of the lens, and the different layers becoming more homogeneous. Late in life the ciliary muscle becomes less powerful, and this adds to the difficulty. The effect of this progressive diminution is to cause the near point to recede from the eye. From the tenth year there is a steady decline in the dynamic refraction and a relative recession of the near point. This is shown diagrammatically in Fig. 19 devised by Donders.

The numbers along the top refer to the ages, and those at the side give the number of dioptries. The line starting at zero and terminating in the curve *rr* shows the static refraction, which remains unchanged until the fifty-fifth year, when it diminishes. At this age the emmetropic eye becomes hyperopic, the hyperopic eye more hyperopic and the myopic eye less myopic.

The curve  $p\ p$  shows the maximum refracting power and how it progressively diminishes as age advances.

Both curves meet at the age of seventy-three, which marks the point when accommodation ceases. The number of dioptries included between the two curves on any given vertical line expresses the amplitude of accommodation at the age which the vertical line represents.

FIG. 19.



Range of accommodation at different ages.

The change in the amplitude of accommodation is the same in all eyes, whether emmetropic or ametropic, though it will be seen that the position of the near point will vary with the condition of the static refraction. From the diagram we obtain the following table giving the range of accommodation at different ages:

YEARS.	RANGE OF ACCOMMODATION.
10 . . . . .	14. D
15 . . . . .	12. D

20 . . . . .	10. D
25 . . . . .	8.50 D
30 . . . . .	7.
35 . . . . .	5.50 D
40 . . . . .	4.50 D
45 . . . . .	3.50 D
50 . . . . .	2.50 D
55 . . . . .	1.75 D
60 . . . . .	1. D
65 . . . . .	0.75 D
70 . . . . .	0.25 D
75 . . . . .	0

The recession of the near point does not give rise to any disturbance until it passes beyond the distance at which the person ordinarily reads, writes or sews. When this occurs such occupations become difficult, on account of the small retinal images obtained. This distance differs with different people, therefore 22 cm., the point selected by Donders as the commencement of presbyopia, is purely arbitrary, though it is customary to state that such is the case. In order to see at 22 cm. a positive refracting power of 4.5 *D.* is necessary, and if the range of accommodation is less than that presbyopia is present. As the emmetropic eye at forty has just that amount, presbyopia commences in such an eye at that age. A hyperopic eye, however, would become presbyopic earlier, and a myopic eye later, depending upon the degree of the ametropia. Thus a hyperope of 1. *D.* would become presbyopic at thirty-five, because the amount of his hyperopia deducted from his range of accommodation, 5.50 *D.*—1. *D.*, leaves him but 4.50 *D.* or just sufficient to bring the near point to 22 cm. A myope of 1. *D.* would not become presbyopic until forty-five, because his myopia added to his range would give him a positive refraction of 4.50 *D.*

Thus it will be seen that it is always necessary to take a patient's static refraction into account before fitting him for near work.

If presbyopia is considered present when the near point recedes beyond 22 cm., it is obvious that it is corrected by that convex glass which brings it back to that point, and the amount is measured by the glass which does so.

Most text-books give a table showing the amount of presbyopia present in an emmetropic eye at various ages to assist the student in determining the amount in a patient.

As this is only approximate, and as all people do not want to hold their work at 22 cm., the wisdom of it is very questionable. It is far better to individualize every case. Book-keepers, painters, violinists, carpenters, etc., work at a greater distance than 22 cm., and watch-makers and engravers at a shorter distance. The best course to pursue is to find the distance at which their work must be held, and fit them for that particular distance.

The theoretical glass having been determined in this manner, it is necessary, as Dr. Norton first pointed out some years ago in a paper read before the Homœopathic Medical Society of the County of New York, to test the muscles at the near point with the glasses on, and if exophoria be present their strength reduced and if esophoria be present their strength increased. The method of ascertaining this is described in the chapter on the muscles.

## CHAPTER IV.

## Dioptrmetry.

BY CHAS. H. HELFRICH, M. D., SURGEON TO THE N. Y. OPHTHALMIC HOSPITAL.

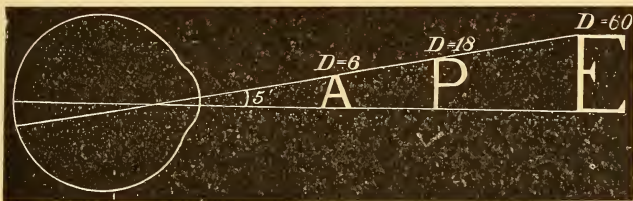
By dioptrmetry is understood the methods for determining the refraction and accommodation of the eye. These methods are of two kinds—*subjective* and *objective*.

SUBJECTIVE DIOPTOMETRY embraces the methods which depend largely upon the statements of the patients themselves.

The method which is almost universally used, and which it is wise always to employ even though other methods are also followed, is that based upon the acuteness of vision.

It has been determined by experiment that the smallest distance separating two objects which permits of their being seen discrete is one that subtends a visual angle of one minute. Nearer than that they appear as one. The visual angle may be conceived to be formed by lines extending from the extremities of an object which meet at the nodal point of the eye, as in Fig. 20.

FIG. 20.



The visual angle.

These lines represent secondary axes, which cross each other at the nodal point without undergoing refraction, and upon reaching the retina determine the size of the retinal image.



Snellen's test-types which are in general use are based upon this principle. Each letter as a whole, held at the distance marked above it, subtends an angle of 5', while the component strokes and the spaces between contiguous strokes subtend angles of 1'.

It is evident by the figure that the distance of the object is an important matter. The size of the object remaining the same, the angle becomes larger the nearer the object is brought to the eye; while conversely, the greater the distance the larger the object must be to preserve the same angle. Snellen's test-types are so designed that they are seen under a visual angle of five minutes when held at the distance at which they should be seen. The largest type should be seen at 60 metres by the normal eye, and from this they range down to a size visible at five metres. Fig. 22 shows them reduced in size. In testing the acuteness of vision, which is the first step to be taken, the patient should be seated with his back to the light and the test-type for distance placed opposite him at a distance of five metres or more, as space will permit. Such a distance is practically, infinity, and has the advantage that such rays which come from the card and enter the eye are parallel. Testing each eye separately, the patient is asked to read the smallest line of letters he can. His acuteness of vision ( $V$ ) is expressed by a fraction, the numerator of which represents the distance of the test-card and the denominator, the distance at which the line of type he read should be distinguished. Thus, if he simply read the largest type at a distance of five metres his acuteness of vision would be expressed as follows:

$$V = \frac{5}{60}$$

It is important not to reduce the fraction, as it represents both the distance and the line read.

The abbreviations *O. D.* and *O. S.* respectively stand for the right and left eye, and are utilized for designating the eye examined. The abbreviation *O. U.* stands for both eyes used simultaneously. Should the patient's sight be so bad that he is unable to read the largest type, the greatest distance at which he can count the examiner's fingers should be ascertained. If even this is impossible, he should be placed in a dark room, and by alternately shading and uncovering a lighted candle his power to distinguish light should be noted.

After the acuteness of vision has been ascertained and recorded,



the next step is the determination of the static refraction. In order to do this, it is necessary to possess a case of trial lenses and appurtenances, such as can be found at a first-class optician's, and several trial frames. The numbering of lenses is now almost universally after the metric system which takes as the unit a lens having a refractive power of 1 dioptré, and which has a focal length of 1 metre, or about 40 inches.

A lens of 2 *D.* is twice as strong and, therefore, has a focal distance of half a metre. Between the whole numbers are lenses of .25 *D.*, .50 *D.* and .75 *D.* The advantage of this system over the old or English system, where a strong lens was taken as the unit and where the number expressed the focal distance and not the refractive power, is that we are dealing with whole numbers in our calculations and not with vulgar fractions. It is a very simple matter both to find the focal distance of a given lens of the dioptric system and its equivalent in the English system.

If it be required to find the focal distance of a given lens of the dioptric system, divide 100 centimeters (1 metre) by the number of the lens and the answer will be the focal length in centimetres. For example, the focal length of 5 *D.* is  $\frac{100}{5} = 20$  cm. If the focal length is known and we desire to ascertain its dioptric number, we divide 100 cm. by the focal length, as for example with a focal length of 20 cm., thus  $\frac{100}{20} = 5$ . *D.*

In translating from the old inch system to the metric, we can consider 40 inches equal to one metre, and to obtain its dioptric equivalent, we divide 40 by the number of the lens in inches. For instance, No. 20 of the old system is equal to 2. *D.*, for  $\frac{40}{20} = 2$ .

To convex lenses is given the plus sign (+), and to concave lenses the minus (—) sign.

In ascertaining the static refraction, each eye must be tested separately, as in the case of the acuteness of vision. Considerable advantage is obtained by commencing the test with convex spherical lenses, as these cannot be overcome by an effort of the accommodation. If these lenses increase the acuteness of vision, or do not make it worse, the refraction is hyperopic. Should the weakest convex lenses make the vision worse, concave spherical lenses should be employed. In the event of their failure to improve, convex cylindrical lenses are next utilized, and lastly concave cylinders.

Even though the acuteness of vision is normal in the first place, it is still necessary to place convex lenses in front of the eye in order to determine if there is any manifest hyperopia present. Under such circumstances the strongest convex lens through which the said line of type can be read is the measure of the manifest hyperopia. In some instances the acuteness of vision may not be up to the normal, and no lens or combination of lenses makes it so, though the same line can be read equally well with convex lenses up to a certain strength. In this case the strongest lens also represents the manifest hyperopia. If convex lenses improve the vision to a certain degree, but short of the normal, recourse should next be had to convex cylindrical lenses in addition to the strongest sphericals found, which may bring it up to normal, the case being one of compound hyperopic astigmatism. The cylinder must be rotated in front of the spherical until the axis of the astigmatism is found. The strongest convex cylinder should be ascertained as in the case of convex sphericals.

In the event of failure with convex glasses, concave ones should be employed. Unless they actually improve the vision they are not to be considered, because all eyes, no matter what their refraction is, can overcome the weaker concave lenses by an effort of the accommodation. Presuming, however, that they do improve the vision, the weakest concave glass which produces the maximum acuteness obtainable is the measure of the myopia.

If the vision is improved somewhat by concave glasses, though not up to normal, concave cylinders should be tried in addition to the weakest spherical obtained in the first place, and the combination may bring the vision up to normal. This would indicate compound myopic astigmatism.

Failing with both convex and concave sphericals, convex cylinders should be employed to find if simple hyperopic astigmatism exists. The cylinder should be slowly rotated in the frames in order to find at what axis it seems best. This being found, stronger lenses are placed in the frames at this axis until the maximum improvement is obtained.

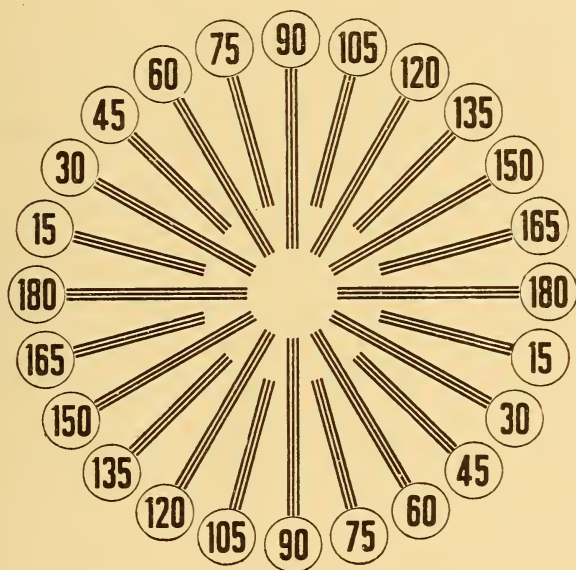
In the case of simple hyperopic astigmatism the strongest convex cylinder represents the measure of it. Simple myopic astigmatism is tested in a similar manner, but here the weakest concave cylinder is the measure.

In testing as if for simple hyperopic astigmatism, a certain improvement may be obtained, but less than normal. Leaving the strongest convex cylinder so ascertained in position, concave cylinders are added in a position at right angles to the former until the maximum improvement is obtained.

Such a combination composed of the strongest convex cylinder and the weakest concave cylinder is the measure of the mixed astigmatism.

This, in brief, is the plan to be followed in the examination of

FIG. 21.



Wallace's astigmatic chart.

any given case, and if closely adhered to will prevent much confusion and loss of time.

There are other methods of determining the astigmatism which must also be employed either as soon as its presence is determined or as a check upon results obtained after the former methods. Thus the presence of astigmatism is frequently discovered by asking the patient to look at the clock-face test-type, made up of lines, in series of three, radiating from a center in various directions. Wallace's astigmatic chart is one of the most convenient. If

astigmatism is present, one set of lines will stand out clear and distinct, while the others, but especially those at right angles to the first, will be indistinct. These designate the principal meridians of the astigmatism. Or the stenopaic slit may be rotated in front of the eye until a point is found where the vision is most distinct, which will designate one of the principal meridians, and as the meridians are always at right angles to one another the other meridian is determined at the same time. Convex and concave glasses are now placed in front of the slit and the degree of hyperopia or myopia, if either exists, ascertained. Next, rotating the slit to a position at right angles to the first the same procedure is again followed out. If convex lenses improve or do not make the vision worse in one meridian, and concave lenses fail to improve it in the other, the case is one of simple hyperopic astigmatism. If concave glasses improve the vision in one position, and convex glasses make it worse in the other, simple myopic astigmatism is present.

If convex glasses improve or do not make vision worse in both positions, it is a case of compound hyperopic astigmatism. The difference between the strongest convex glass in each position represents the astigmatism, and the weaker of the two, thus found, the hyperopia. Compound myopic astigmatism is determined in the same manner by the difference between the two weakest concave glasses.

If the case is mixed astigmatism, convex glasses will improve or will not make the vision worse in one position and concave glasses will improve the vision in the other.

Numerous combinations and variations of these methods are made by different surgeons, but the same principles hold good throughout.

After the astigmatism is determined by any of these methods, it is usual to place the correcting lenses in the frames and have the patient look at the clock face, when, if the astigmatism is properly corrected, the lines will all appear similar.

In all cases of astigmatism, or in any case where spasm of the accommodation is found or suspected, the test should also be made under the influence of a cycloplegic.

**Cycloplegics.**—By cycloplegics are meant those drugs which produce temporary paralysis of the ciliary muscle, and therefore



suspension of the accommodation. The importance of this in determining ametropia has been stated in the preceding chapter. In addition, however, complete physiological rest of the eyes is obtained which often removes congestive conditions of the retina and choroid, and later when glasses are prescribed they give more comfort than they would have done without the use of a cycloplegic. The drugs most commonly employed are the sulphates of atropine, hyoscyamine and duboisine and the hydrobromates of homatropine and scopolamine.

(1) *Atropine* is usually employed in a strength of four grains to the ounce. Ordinarily it paralyzes the accommodation in about two hours and the effects remain for a week. A drop of the solution should be dropped into the outer canthus three times during one day. In cases of marked spasm of the accommodation in young hyperopic subjects it can be continued for several days.

(2) *Hyoscyamine* and *Duboisine* are employed in the form of solutions made up of two grains to the ounce. Their action is much more rapid than atropine and their cycloplegic effect more transitory.

(3) *Scopolamine* may either be employed in a one per cent. solution, a single drop being instilled, or in a one-fifth per cent. solution, one drop every fifteen minutes for an hour and a half. Cycloplegia occurs in about forty-five minutes and lasts from three to five days. Toxic symptoms sometimes develop, so considerable care should be exercised.

(4) *Homatropine* used in a three per cent. solution, one drop being instilled every fifteen minutes for an hour and a-half preceding the examination, can be employed when a very transitory effect on the ciliary muscle is desired. Its effect is increased by dropping a drop of a four per cent. solution of cocaine in the eye each time before instilling the homatropine. The cycloplegic effects of homatropine pass off in about fifty hours, and are in a degree neutralized by eserine.

It is not safe to use strong cycloplegics in elderly people on account of the danger of precipitating an attack of glaucoma. Of course, they must never be employed if glaucoma is suspected or present. It is unnecessary to use them in people whose advanced age denotes that the accommodative power is very weak.

Patients soon become familiar with the letters on a test card, and children are apt to memorize them before being tested, so it is advisable to have several cards with different letters. Thus a new card should always be displayed for each eye, and if at any time there is any suspicion that the patient is drawing upon his memory a different one must be substituted. In order to avoid the necessity of walking across the room each time to make such a change,

FIG. 22.



Helfrich's changeable test-type.

and especially in order to be able to make it without the patient's knowledge, I devised a changeable test-type, the plans of which were presented to Messrs. Clairmont & Co., of New York, who made the apparatus and perfected the motor for working it. This instrument was described in a paper read before the Homœopathic Medical Society of the County of New York in 1893.

It is illustrated in Fig. 22.



The apparatus consists of an ornamented wooden case, upon which are mounted the ordinary Snellen test-types. The five lower lines only are capable of being changed, the change being produced by the revolution of five quadrangular rollers permitting the exhibition of four series of letters. Motor power is furnished by an accordion-pleated rubber tube, which, when expanded by the column of air communicated to it by the pressure of a bulb, elevates a weight to which is attached an arm. As the arm moves upward it carries a cog which locks with the wheel that revolves the five rollers. This wheel contains four slots, placed at intervals of ninety degrees, for the reception of two catches, an upper and a lower one, which limit the revolution of the wheel to a quarter of a circle. After each quarter revolution the weight carries the arm back to its former position, setting the apparatus for the next change. It is operated by a bulb at the side of the patient, which is connected with the motor by tubing.

An instrument called the Refractometer has been invented by H. L. De Zeng, whose purpose is the estimation of the total refractive error and particularly the whole amount of astigmatism present in all the dioptric media without the use of a cycloplegic.

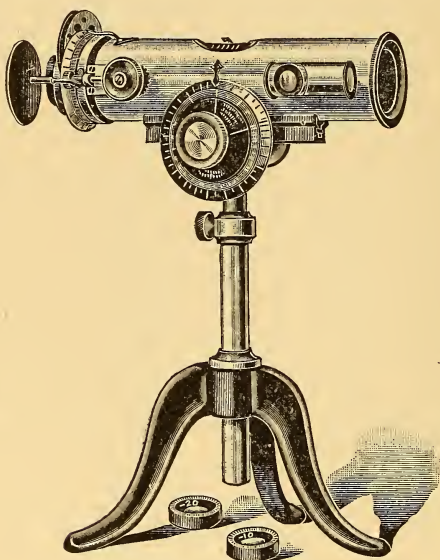
This instrument shown in Fig. 23 is manufactured by the Cataract Optical Co., of Buffalo. While disclaiming that any mechanical device can wholly replace the ordinary test under a cycloplegic this instrument is certainly of great value where a cycloplegic is contra-indicated or refused, as well as in general routine work.

In brief this instrument consists of a nickel tube, in the head of which is placed a stationery concave lens of 20. D. It also contains an inner tube which is movable along its cylindrical axis by means of a rack and pinion adjustment, and which carries at its front end a convex achromatic objective. These lenses in combination at different distances give all the spherical foci from  $+ .12$  D to  $+ 18$ . D, and from  $- .12$  D to  $- 9$ . D inclusive. The convex spherical effects are recorded upon a revolving dial at the side and the concave effects upon the top of the inner tube, visible to the observer through an oval opening in the top of the outer tube.

Owing to the range of the negative scale being limited to  $- 9$ . D, two auxilliary caps accompany the instrument, one containing

— 10. D and the other — 20. D, which, when placed over the eye piece raises the negative scale to either — 19. D or — 29. D respectively. The outer tube is further armed at its front end with a revolving head, composed of two revolving discs, containing blanks, a stenopaic slit, and eleven minus concave cylinders set at right angles with their radii. The resulting combinations possible give a range of cylindrical lenses from — .12 D to — 8.75 D, which can be rotated to any given axis, the latter being indicated by a pointer.

FIG. 23.



De Zeng's refractometer.

By reason of the instrument's optical construction, it has an amplification of two and one-third diameters, and in consequence of this the test-types furnished with it are reduced to three-sevenths of the size of Snellen's letters, so that the visual acuity may be reliably estimated with the instrument. The instrument must be properly adjusted for whatever range is desired, either 3, 4, 5 or 6 metres.

The best method employed in testing is what is known as the "fogging system," which consists in over-correcting a hyperopic

eye with convex lenses or under-correcting a myopic one with concave lenses which are too weak. The effect of this is to render the lines and letters deeply blurred, which causes relaxation of the ciliary muscle and in consequence latent errors to become manifest. With the instrument properly adjusted, and the patient properly placed, the thumb-screw is turned until the test-letters are distinctly seen and the reading noted.

Fogging is next resorted to by producing artificial myopia, which encourages relaxation of the accommodation. The thumb-screw is now turned slowly back and the patient requested to watch the astigmatic fan. If he states that one or more lines appear distinct before the others he is astigmatic, whereas if they appear equally distinct simultaneously the error is simple hyperopia or myopia. If astigmatism is present it is necessary to utilize the concave cylinders contained in the revolving discs to render the lines equally clear. This procedure should be repeated to verify the result or to make any necessary corrections.

The power of convergence is tested with an optho-dynamometer, that of Landolt's being the simplest and best. It consists of a metallic cylinder blackened on the outside, containing a vertical slit 0.3 mm. wide covered with ground glass. Beneath the cylinder is attached a tape measure graduated on one side in centimetres, and on the other in metre-angles. The vertical line of light, produced when the cylinder is placed over a lighted candle, is the object of fixation. Approaching the patient in the median line until the patient sees the line double the near point of convergence is found and the distance in centimetres with its equivalent in metre-angles recorded. The minimum of convergence is found by withdrawing the instrument from the patient; but as it is usually negative, it is determined by the strength of the strongest abducting prism which will not cause diplopia with the patient fixing the object at six metres. If the number of this prism is divided by seven, the quotient will approximately give in metre-angles the deviation of each eye when the prism is placed before one. The amplitude of convergence is equivalent to the difference between the maximum and minimum of convergence.

Accommodation is tested by means of the reading types of Snellen or Jæger. A sample is shown in Fig. 24.

It is necessary to test each eye separately, and finally both to-

gether. The nearest point the type can be read represents the punctum proximum. This subject has already been discussed in the preceding chapter.

Presbyopia is to be determined after the static refraction has been tested. With the distance glasses in the frame, the patient is asked to hold the reading type or a newspaper at the distance at which he desires to work or read. Convex glasses are now added to the distance glasses, until the best vision at this distance is obtained. The optical equivalent of the glasses before each eye is

FIG. 24.

O. D.

The stone best adapted for lithographic purposes is a calcareous slate found on the banks of the Danube, in Bavaria, the finest being found near Munich. A good stone is porous, yet brittle, of a pale yellowish drab, and sometimes of a gray neutral tint. The stones are formed into slabs from one and a half to three inches in thickness. To prepare them for use, two stones are put face to face with some fine sifted sand between them, and then are rubbed together with a circular

O. S.

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.50M.

O. D.

The artist completes a chalk drawing upon a grained stone as he would make one with pencil or chalk upon paper. If while in this state a wet sponge is passed over the face of the stone, the drawing will rub off. To

O. S.

The artist completes a chalk drawing upon a grained stone as he would make one with pencil or chalk upon paper. If while in this state a wet sponge is passed over the face of the stone, the drawing will rub off. To

.75M.

Type for testing accommodation.

now computed, and the resultant glass is presumably his prescription for near. The approximate amount of presbyopia at different ages can be computed from the chart (Fig. 19) given in the previous chapter. This amount must be added to the amount of hyperopia and deducted from myopia. This should not be considered as final, but used simply as a check on the result obtained by testing and to save unnecessary loss of time.



**OBJECTIVE DIOPTRY.**—Objective dioptry embraces the methods of determining the refraction independent of any statements by the patient. These methods are valuable in conjunction with the test made by the trial lenses and test letters, and especially so when the patient is illiterate or too young to read letters.

Frequently they are utilized to save time in arriving at an approximate estimate of the error, the accurate degree of which is fully determined in the ordinary manner. Not that they are inaccurate in themselves when applied by an expert, but because it is a safer plan to check results.

**Estimation of Refraction by the Direct Method**—A *qualitative* estimation can be made with the ophthalmoscope held at a little distance from the observed eye. When it is remembered that the rays issuing from a hyperopic eye are divergent and those from a myopic eye convergent, it is easy to understand how an observer can see an upright image of the retinal vessels in the former and an inverted aerial image in front of the latter. If the observer moves his head from side to side, the vessels seen in a hyperopic eye will move with the mirror, the image being upright, while they will move in the opposite direction if the eye be myopic. At this distance no vessels can be seen in an emmetropic eye, because the pencils of rays emanating from any two points upon the retina (each is made up of parallel rays) will diverge from each other so that no rays will enter the observer's eye. Close to the eye, however, an upright image of the fundus can be seen. The *quantitative* examination is conducted with the mirror held close to the observed eye, if possible as near as 13 mm., the anterior focus of the eye and the proper situation for the glasses to be worn. If the examination is conducted at a greater distance proper allowance must be made. In following out this method, it is imperative that both the surgeon and the patient thoroughly relax their accommodation. This is easily accomplished for the patient, if no spasm exists, when the examination is made in a dark room, but the examiner can only attain it after much practice. It is rather doubtful if any expert can relax his accommodation absolutely unless he be so old that he practically has none. Still, many can do so thoroughly enough to obtain approximately correct tests.

The most desirable point in the eye-ground upon which to focus is either the edge of the disc or the medium-sized vessels between the disc and the macula, especially two vessels running at right angles to each other. The macula is unsuitable, because of the contraction of the pupil caused by throwing the light upon it and the annoying corneal reflections obtained.

If the observer has any error of refraction, it must either be corrected with glasses or allowance made for it in computing the final result. All these conditions being fulfilled the examination is commenced. If the patient's eye is emmetropic, the vessels will be seen distinctly, and convex lenses rotated back of the opening in the ophthalmoscope will blur them. If hyperopia is present the divergent rays issuing from the eye are rendered parallel by the rotation of convex lenses, and the strongest convex lens through which the vessels are seen distinctly is the measure of the error. The convergent rays from a myopic eye are rendered parallel by concave glasses, and the weakest concave lens through which the vessels are seen most distinctly is a measure of the myopia. The direct method is used to determine the height of retinal tumors by estimating the refraction at their summit, and the depth of a cupping of the papilla by estimating the refraction at its bottom.

If the examination is conducted at a distance not more than 2.5 cm. from an eye, a hyperopia of 1. D will represent a shortening of the axis equal to 0.3 mm. and a myopia of 1. D a lengthening of the axis to that same amount.

Astigmatism can also be estimated by this method. It is known to be present when the upper and lower margins of the disc and the horizontal vessels are well defined while the lateral margins and vertical vessels are blurred, or *vice versa*.

Its presence may also be suspected if the disc is elongated either horizontally, or vertically, the long axis corresponding to the meridian of greatest refraction.

In estimating the degree it is the best to fix two vessels running at right angles to each other and whose direction conform most nearly to the principal meridians of the astigmatism. If the vessels in one meridian are seen distinctly, while in order to see the vessels in the opposite meridian a convex or concave lens is necessary, the case is respectively one of simple hyperopic or



myopic astigmatism. If, in order to see distinctly the vessels in the two principal meridians, two convex or two concave lenses of different strength is required, the case is one of compound astigmatism, either hyperopic or myopic. The difference in strength between the two convex or two concave lenses represents the astigmatism, while the weaker lens represents the simple hyperopia or myopia. The axis of the cylinder to correct the astigmatism is placed in the direction of the vessel which was seen through the strongest of the two lenses.

It seems unnecessary to again state that in hyperopic astigmatism the strongest convex lenses represent the measure and in myopic astigmatism the weakest concave.

In mixed astigmatism the vessels in one meridian are rendered distinct by convex glasses and the vessels in the opposite meridian by concave glasses. Hyperopia exists in the meridian at right angles to that in which the vessels were made distinct by the convex glasses and myopia exists in the other. The axes of the cylinders to correct this would be the reverse of this, because they refract only those rays which enter at right angles to their axes.

**Estimation of the Refraction by the Indirect Method.**—This method is not generally resorted to, because of its difficulties. It is sometimes used in estimating very high degrees of myopia, but rarely in hyperopia. The rays coming from an emmetropic eye being parallel they are brought to a focus by the object glass at its principal focus, whereas the divergent rays from a hyperopic eye are brought to a focus farther from the object glass than its principal focus and the convergent rays from a myopic eye nearer than its principal focus. The degree of the ametropia is determined by measuring this distance. Schmidt-Rimpler's method is usually employed.

Schweigger uses the indirect method in comparison with the direct method to determine the presence of astigmatism. It has already been explained that the disc appears elongated in the direction of the meridian of greatest refraction when seen in the upright image, so it is only necessary to state that the reverse obtains in the inverted image.

**Skiascopy (Retinoscopy, or the Shadow Test).**—This is a method of determining the refraction by observing the direction in which the light appears to move across the pupil when the

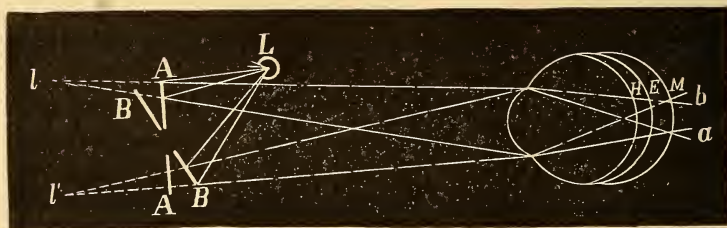
mirror is rotated in various directions. The test should be made in a dark room at a distance of one metre from the patient. It is convenient to place a tape on the wall extending from the position of the examined eye to a distance beyond that of the observer. This is graduated in centimetres, and at appropriate intervals the corresponding number of dioptries marked. Either a plane or concave mirror can be employed, but the preference is with the former. The light is covered with an opaque asbestos shade having an aperture 1 cm. in diameter. If the plane mirror is used the light should be near the surgeon, but if the concave mirror is used, behind the patient. The arrangement is shown in Fig. 25.

Skiascopy has been elaborated especially by Jackson, whose description is here followed and whose work is the ablest published.

By rotating the mirror the area of light it throws on the face is made to move in the direction the mirror is rotated. Those rays which enter the pupil form a small light area on the retina, which also moves when the mirror is rotated. This area moves with the light on the face when the plane mirror is used and in the opposite direction if the concave mirror is employed.

For the plane mirror this movement is shown in Fig. 26.

FIG. 26.



Movement of the light area on the retina with the plane mirror.

When the mirror occupies the position A A the rays from L which enter the eye are reflected as if they came from L, and after passing through the eye are condensed at a, on the lower part of the retina. At the same time the light falls on the lower part of

<sup>1</sup> Skiascopy by Dr. Edward Jackson.

FIG. 25.



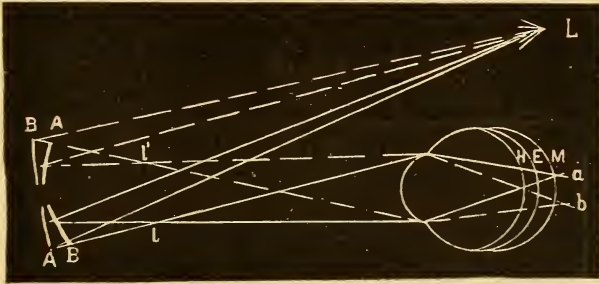
Correct position for retinoscopy.



the face. If now the mirror is rotated to B B the light which enters the eye is reflected as if it came from  $l'$ , and is condensed toward  $b$ , on the upper part of the retina. Simultaneously the light which falls on the face moves upward also. The same movement of the light with the light on the face occurs in hyperopia and myopia as well as in emmetropia.

The movement of the light area on the retina caused by a concave mirror is shown in Fig. 27.

FIG. 27.



Movement of the light area on the retina with the concave mirror.

When the mirror occupies the position A A the rays which enter the eye come from the focus of the mirror at  $l$  and are condensed towards  $a$ , on the upper part of the retina, while the light falls on the lower part of the face. When the mirror is rotated to B B the rays which enter the eye come from  $l'$  and are condensed towards  $b$ , on the lower part of the retina, while the light on the face moves upward. The same is true in hyperopia and myopia.

The *real* movement of the light on the retina, as it would appear from behind, is always with the light on the face with the plane mirror and in the opposite direction with the concave mirror.

In our examination, however, we do not see it in that way, but we watch the *apparent* movement as seen through the pupil. *When the plane mirror is used the apparent movement in the pupil and the real movement on the retina are the same when the observer sees an erect image, and in the opposite direction when he sees an inverted image.*

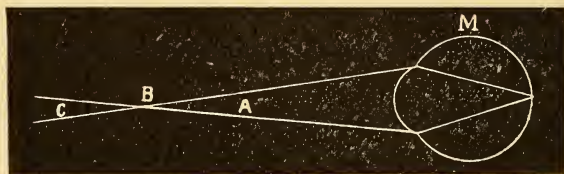


The reverse of this obtains with the concave mirror.

The rays of light coming from a myopic eye are convergent and cross each other at its far point, and proceed divergently. The point B (Fig. 28), at which they cross and which corresponds to the far point, is known as the *point of reversal*. As has been explained under myopia, the distance of the far point from the eye represents the focal length of the glass required to correct it, and, therefore, if the point of reversal is known the amount of myopia is also known.

Retinoscopy is an accurate method of determining the point of reversal.

FIG. 28.



The point of reversal of a myopic eye.

In the following description it is assumed that the plane mirror is used, though it will apply equally to the concave mirror if we reverse the movement in the pupil and change the lenses. If the mirror is held closer to the eye than its point of reversal, as at A (Fig. 28), an erect image is seen, and the light in the pupil will seem to move with the light on the face. Beyond the point of reversal, as at C, an inverted image is seen, and the light will appear to move in an opposite direction to the light on the face.

At the point of reversal it is impossible to see which way the light moves, and the illumination is much more feeble. At a distance of one or two metres from the point of reversal the illumination is very bright, but as the distance increases it becomes more and more feeble. Without altering the rapidity of the movement of the mirror, the apparent movement of the light is more rapid as we approach the point of reversal.

While the test depends mainly on the direction of the movement

of the light in the pupil, the degree of illumination and the rapidity of movement aid in arriving at a diagnosis.

*Myopia* is estimated by finding the nearest point that an inverted image is seen (C, Fig. 28) and the most distant point at which an upright image is seen, as at A. Midway between the two is the point of reversal, B, whose distance from the eye should be noted on the tape for that purpose, and the number of dioptres corresponding is the measure of the myopia. Thus if C is at 55 cm. and A at 45 cm. B would be at 50 cm., which corresponds to 2 D. giving a myopia of that amount. When the myopia is of high degree, the point of reversal lies very close to the eye, and in this situation a slight error in marking the distance may mean an error of a dioptre or more in estimating the myopia; whereas if a similar error is made when the point of reversal is situated at a metre or more from the eye it is unimportant. Therefore, in high degrees of myopia, in order to check results, it is well to correct all but about one dioptre by placing a suitable concave lens in a frame before the eye and measure the remainder, which is to be added to the lens in the frame.

If the myopia is less than one dioptre, the point of reversal lies so far away from the eye that when near it one cannot see which way the light moves. In this case put a weak convex glass in the frame to increase the myopia, then determine the point of reversal, and deduct the convex glass from the amount of myopia found.

*Hyperopia* gives an upright image no matter how far we recede from the eye, because the rays leave it divergently. In order to obtain a point of reversal, it is necessary to convert it into an artificial myopia by putting a convex glass in the frame and then finding the point of reversal as in myopia. The amount of myopia is to be deducted from the convex lens, the hyperopia being represented by the remainder.

Thus, if a convex 5 D lens is placed in the frame, and the point of reversal is found at 1 metre (1 D), the hyperopia will be 4 D. That is, 4 D out of the five were necessary to render the divergent rays parallel and the other dioptre to bring them to a focus at 1 metre.

*Emmetropia* acts the same as hyperopia, but when a convex

lens is added the myopia produced equals the strength of the lens, proving that the rays were parallel in the first place.

In *astigmatism* the refraction of the principal meridians is obtained in the same way as in myopia or hyperopia. In order to determine the refraction of a certain meridian, it is necessary to rotate the mirror about an axis at right angles to it, which causes the light to traverse the length of the meridian. The direction of the meridian is revealed by the area of light assuming a *band-like* shape as its point of reversal is approached. This is most marked in the higher degrees of astigmatism. Near the point of reversal, where the band-like appearance is most distinct, it is easy to cause the apparent movement from side to side, but more difficult in the direction of the length of the band. The latter, however, is to be watched, as it determines the point of reversal.

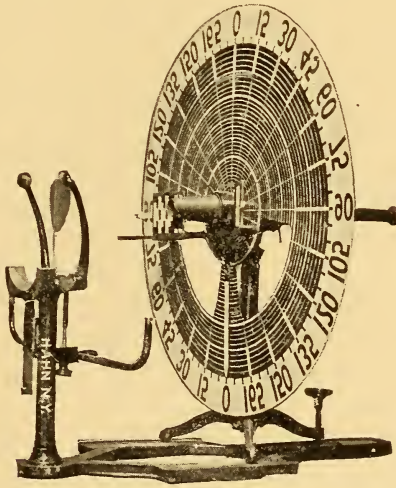
If the astigmatism is of low degree, this band-like appearance may not be perceptible; but when we have determined the point of reversal of one meridian it will be found that there is still distinct movement, either upright or inverted, in the direction at right angles to this. Supposing the case to be one of myopic astigmatism, either natural or artificial, and the surgeon starts at a point nearer the eye than either point of reversal and gradually withdraws from it, the following phenomena occur: At the start the movement will be with the light on the face in all directions. Withdrawing to the nearest point of reversal there will be no movement in the meridian whose reversal-point it is, but direct movement at right angles to it. Between the two points of reversal the former meridian gives an inverted movement and the latter direct. At the farthest reversal-point the direct movement for that meridian ceases and the other remains indirect. Beyond both points of reversal the movement is against the mirror in all directions. The degree of the myopia of both principal meridians, either natural or artificial, having been determined, the astigmatism present is represented by the difference between them. As a final test the cylinder correcting the astigmatism should be put in the frame together with the concave or convex lens which will remove the point of reversal to about 1 metre, and the movements watched again.

When using the concave mirror the position of the observer

does not admit of much change, the distance being generally one metre. The movements of the light are the reverse of those just described. Skiascopy is the most valuable of all objective methods, and the student should practice it industriously upon an artificial eye made for the purpose before he can depend upon his results in actual practice.

**Ophthalmometry.**—The term indicates mensuration of the eye, but it is usually employed to mean the measurement of the radii of curvature of the cornea and the corneal astigmatism present in an eye with the ophthalmometer. The ophthalmometer in general use in this country is that of Javal and Schiötz and is shown in Fig. 29.

FIG. 29.



Javal and Schiötz ophthalmometer.

The principles upon which it is based are as follows: The surface of the cornea acts as a convex reflector, the size of the image produced by it, of an object of known size at a known distance, depending on its radius of curvature. The size of the image is determined by doubling it with a double refracting prism, and then altering the strength of the prism until the images come into contact. When this has taken place, a displacement equal to the size of the image has been produced. Two objects



known as mires are situated upon an arc, one a white rectilinear figure, which is stationary, and the other, made up of white enameled blocks, capable of being moved along the arc. These objects are so placed that their images are reflected by the cornea and are viewed through a telescope by the observer. The telescope contains a prism (to double the images) placed between two bi-convex lenses, with a third bi-convex lens to shorten the posterior foci of the two images. It stands upon a tripod, which can be moved in order to obtain the proper focus. The patient places his chin on the rest and looks in the tube, the eye which is not under observation being covered by a disc.

When everything is properly adjusted, the central images are obtained on a spider web, also provided in the tube, and the movable object is moved along the arc until its image comes in contact with the image of the rectilinear object. Its position on the arc is noted upon the index.

The arc itself is now turned on its own axis to a position at right angles to its first position, and the relation of the two images noted. If astigmatism is present, they will either overlap or separate, but if absent, they will occupy the same relative position. The degree of astigmatism is measured by the overlapping, each step of the white enameled block representing one dioptré. If the reflections are separated in the second position they are brought in contact once more and the arc turned back to its primary position, where they will overlap. The overlapping in this case will give the measure of an astigmatism against the rule; that of the previous instance with the rule.

The ophthalmometer merely measures the corneal astigmatism and not the refraction of the eye. Corneal astigmatism may be modified by lental astigmatism, consequently the ordinary test with the trial lenses should always be made in addition.

Ophthalmometry is servicable in revealing the corneal astigmatism and the principal meridians.

**General Considerations.**—After the test is completed a proper record of it should be made in the surgeon's case-book. As this is the first step in testing any case, the result forms an integral part of the complete record. To it should be added the record of the correcting lens, and finally the acuteness of vision produced by this lens. The following example will illustrate this:



$$\text{O. D. } V = \frac{5}{8} + 2.50 \text{ D } V = \frac{5}{8}$$

$$\text{O. S. } V = \frac{5}{8} + 0.75 \text{ D } V = \frac{5}{8}$$

When the correcting lens is a compound glass, the component lenses are united by the sign  $\odot$ , which signifies "combined with." Thus a combination composed of a + 3. D spherical with a + 1.50 D cylinder axis vertical is recorded + 3. D<sup>s</sup>  $\odot$  + 1.50 D<sup>c</sup> axis 90°. Notice that the spherical lens is always recorded in advance of the cylinder, and that the sign + or - is expressed to show that the lenses are either convex or concave.

Simple cylinders are ground on one side only, the other side being plane. Compound glasses contain the spherical on one side and the cylinder upon the other. The correcting lenses for mixed astigmatism may either be crossed cylinders, a convex cylinder on one side and a concave cylinder at right angles on the other, or a combination of a spherical with a cylinder. Thus in a case of mixed astigmatism corrected by a convex cylinder of 2. D axis vertical and a concave cylinder of 1. D axis horizontal the prescription may either be + 2. D<sup>c</sup> axis 90  $\Gamma$  - 1. D<sup>c</sup> axis 180, or + 2. D<sup>s</sup>  $\odot$  - 3. D<sup>c</sup> axis 180. The two are optical equivalents. Unless specially ordered to do otherwise, the optician will grind the lens according to the latter. The sign  $\Gamma$  is usually employed when two cylinders are combined, the convex cylinder being expressed first.

Patients should be instructed to return with their glasses after they have obtained them from the optician, in order that the surgeon may ascertain if the lenses have been correctly ground and that the frames are properly fitted. The importance of this cannot be overestimated. The correctness of the lens is verified by neutralizing it with the opposite form of lens, that is, convex spherical and cylinders either alone or in combination are neutralized by concave sphericals or cylinders of the same number. If one holds a convex glass near one eye, and fixes an object like the edge of a door, the edge will appear to move in an opposite direction to the lens when the latter is moved from side to side. With a concave lens it moves in the same direction. If a convex and concave lens of equal strength, held together, are moved in a similar manner, the object will remain stationary, the effect of the convex being neutralized by the concave. Thus the number

of any lens can be ascertained by neutralizing it with the lenses from a trial case, which are always numbered.

The optical centre of the lens should coincide with its geometric centre, unless it has been ordered decentered. To find the optical centre of a lens we can utilize the reflection of a piece of paper pasted on the window pane with our back turned to the window. A reflection of it appears on the anterior and posterior surfaces of the lens and when the images overlies each other the optic axis of the lens is determined and therefore the optical centre which is situated upon this. The point can be marked upon the lens with ink and its situation as regards the geometric centre noted.

It can also be determined by refraction by finding two meridians of the lens at right angles to each other which do not displace a vertical line horizontally when it is viewed through the lens. It is customary to take the edge of a door or a card. When the lens occupies such a position that the vertical line appears as a continuous line, above and below, with that seen through the lens, this meridian is marked by a line with a pen. The glass is rotated at right angles and the same process gone through with again. The point at which these two lines intersect each other is the optical centre. The frames should be so fitted that the pupil is opposite the geometric centre, and the optical centre should coincide with the latter unless it has been purposely decentered. This is the rule when glasses are to be worn for distance or constant use. Near glasses are usually decentered in about 4 mm. on account of the convergence of the visual lines. Reading glasses are also tilted forward and placed lower down than distance glasses, to conform with the depression of the visual line. A decentered glass when not required is sufficient to render void the beneficial effects of the most perfect prescription. Lenses are often decentered in a given direction when a prismatic effect is desired. Convex and concave lenses may be considered as being made up of a series of prisms. The effect of decentering a convex glass in, is equivalent to obtaining a prism with its base in, while to decenter a concave glass inwards produces a prism with its base out. The degree of prismatic effect obtainable depends on the distance the lens is decentered and the strength of the lens. The greater the decentration and the greater the strength of the lens the greater the prismatic effect.

Spectacle frames are always preferable to eye-glasses, and in fact their use is imperative in high grades of astigmatism. Still the prejudices of many patients, particularly women, against them must be regarded if we wish them to wear their glasses, so under these circumstances eye-glasses must frequently be prescribed. Nowadays, with the many improved guards in use, eye-glasses can be fitted nearly as perfectly as spectacles, and if the patient is taught to take proper care of them and to have them readjusted frequently they answer the purpose quite as well.

When separate glasses for reading and distance are required a "bifocal lens" for constant use may be prescribed to avoid the inconvenience of changing from one to the other. Many people never become accustomed to them, however, and often meet with accidents caused by looking through the lower part of the glass when going down stairs or stepping out of a conveyance.

## CHAPTER V.

## Hygiene of the Eye.

Under this heading we shall endeavor to gather together a few very essential and practical points, some of which, while they may be elsewhere considered, are of sufficient importance to merit repetition. Many cases of blindness have undoubtedly resulted from the neglect of simple everyday precautions, which are supposed to be so generally understood, by the laity as well as the medical profession, that we are unable to find any author who has devoted the slightest space to the subject.

The care of the eye commences at birth, and in order to secure its highest usefulness must be continued throughout the whole life. The eyes of the new-born babe should be at once carefully cleansed with warm water or a saturated solution of boracic acid. In all cases of gonorrhœal or leucorrhœal discharge in the mother the method recommended by Credé should always be employed. This consists of the instillation between the eyelids of the child immediately after birth of a 2% solution, gr. x. ad ʒj., of nitrate of silver. This method is practiced by many of the best obstetricians in *all* cases, and since its general adoption the percentage of cases of blindness from ophthalmia neonatorum has been wonderfully reduced. In former years the percentage of blindness from this disease alone formed, in different countries, from 20 to 79 per cent. of all the cases of blindness.

The examination of the eyes of the babe from day to day should be a part of the physician's routine duty for at least one or two weeks, so that the onset of any trouble may be at once met by active treatment. The eyes of young infants should be protected from all glaring lights, and especially the direct rays of the sun, both indoors and out.

The babe should never have its attention attracted by objects held close to the eyes, for repeated convergence at close objects may predispose or even produce strabismus. This observation holds good as the child grows older, for in addition, from

poring over story and picture books, when too fine or held too close to the eyes, myopia threatens. The fine worsted and bead work used in some of the kindergarten teachings is for this reason objectionable. Give the growing child plenty of out-door amusements, where the eyes may have a long range during the developing period of life, and we shall see fewer little ones wearing glasses for myopia and astigmatism.

*School Hygiene.*—We believe that one of the most important fields for the exhibition of the to-day knowledge and interest in hygiene is presented in our educational institutions. When we consider the total number of hours passed in the class rooms during the child's school and college life, the additional hours required for study and preparation outside of the school-room by the present day system of forcing the child too rapidly and all children alike, to keep up with their classes, then when we compare these hours with the time left for recreation, exercise and sleep, and recall that these years are the years of physiological growth, is it any wonder that we find so many commencing their active life as physical wrecks? It is, therefore, plainly a duty we owe to posterity to consider carefully the hygienic environments of our children as well as their mental and moral training. The school life of the growing child should be so regulated as to secure the best mental advancement and at the same time the best physical development. Every observing physician has seen many children who commenced school life in apparently good health soon complaining of headaches, nervousness, loss of appetite and other symptoms indicative of impaired general vigor.

It is, however, not our function to consider the subject of school hygiene in its relation to the general health, but simply as to its bearing upon the eyes of our children.

In the early part of the present century we find attention first called to the relations existing between the myopic eye and the demands of civilized life. Within a comparatively few years more complete and systematic examinations of the eyes of school-children have been made, so that to-day we have as a basis for our statistics the examinations of the eyes of over two hundred thousand pupils of all grades. An analysis of these examinations show that in the primary schools nearly all the children enter with normal eyes. In the higher grades 25 per cent. have



become myopic, while in university life the percentage of myopia has increased to from 60 to 70 per cent., which shows that the number of near-sighted pupils increase from the lowest to the highest schools and that the increase is in direct proportion to the length of time devoted to the strain of school life.

In the face of these facts, it seems the imperative duty of the hour to carefully investigate the cause of this deterioration in the eyes of our children during school life. The evident relationship of this increasing near-sightedness with school work seems to indicate some fault in our educational methods. Owing to the fact that myopia is often hereditary, it is impossible to wholly eradicate the condition for generations to come. We believe, however, that acquired myopia can be prevented, or very greatly decreased, by careful and frequent examinations of the eyes, together with thorough hygienic preventive methods, during the years of physical growth and mental training of the child.

First, as to the importance of frequent examinations of the eyes of children. Statistics prove that a very large proportion of the eyes of young children are hypermetropic. So great is this preponderance that many authorities claim the normal eye to be a hypermetropic one. Careful observations have shown that in almost every instance the change from far to near-sight is through the turnstile of astigmatism. That this change does take place has been proven by the progressive increase in the percentage of myopia during school life. By repeated examinations, from year to year, the first change can be detected and suitable treatment taken to check its progress. We believe that the eyes of every child should be carefully examined at the commencement of school life, and that the examination be repeated every year at least until the time of full development of both body and mind. The care of the teeth commences even earlier than this and is continued through the whole life. We have become educated to the importance and necessity of sending our children to the dentist every six months or year for examination, whether disease is suspected or not. The far more precious and delicate organ, the eye, on the contrary, is almost universally left to do its work unaided and uncared for, until often serious and irreparable damage has been done and the innocent victims of our ignorance and neglect are deprived of the full realization of God's greatest

gift, that of sight. It is not the vision alone that pays the penalty of this criminal neglect, but a long train of physical wrecks brought about through reflex action from eye-strain.

It is not our purpose at this time to go into the details as to how or what general conditions may result from defective eyes, but merely to sound a warning as to the danger from neglect of the eyes in early life. To continue the comparison with the teeth, we can get very acceptable false teeth, when lost from neglect, but artificial eyes have not proven of much practical service.

There is great need of popular education as to the importance of such examinations of the eyes. Parents who follow out the greatest precautions for the welfare of their children in other respects are unmindful in this, through lack of knowledge of its importance.

*Examination of the Eyes Upon Entrance of School.*—Every school should possess a series of test letters, and each scholar at the commencement of each term should have the eyes examined by the teacher. This examination is so simple that any teacher can be instructed in a few moments so that they can determine if any defect exists. All that is essential is a set of Snellen's test-types placed in a good light; the smallest letters should then be read with each eye separately at twenty feet. The child should then be examined with the astigmatic card at the same distance, and the lines running in all directions should appear with each eye alone equally clear and distinct. Then a small card clearly printed in  $4\frac{1}{2}$  point (diamond) type should be read by the child, while the teacher measures with a rule the nearest point at which it can be clearly read. This distance should correspond with the normal near-point of an emmetropic eye, which should be recorded on the back of the card for the different ages from six to twenty years. If these tests show no defect the child may then be admitted to the school, but, on the contrary, if a defect be found in any of the tests, particularly the first, the parents of the child should be at once informed of the existing defect of vision and the consequent need of professional advice. Further than this, during the school year, if the child complains frequently of headaches while studying, or seems to be getting nervous, anæmic, etc., the teacher's duty is to again suggest to the parents the wisdom of seeking a physician's advice.

The examination as suggested would at once detect imperfect vision, from any cause; if due to refractive errors it could then be corrected, if to intra-ocular disease treatment might save the sight which otherwise might possibly be lost.

In all cases of children with inflamed eyes they should be required to present a physician's certificate of the non-infectious nature of the disease before being permitted to enter the schools. Our orphan asylums, public homes and institutions of all kinds require a physician's certificate before admitting children with any redness or inflammation of the eyes. Should we be any less strict before permitting these children to associate with the healthy ones in our schools?

Let us now consider other faulty conditions of school life which bear more or less directly upon the eye as well as the general health of the child. The curriculum of study in the majority of public schools is a hard and fast one, which all students are expected to follow. We believe a more elastic curriculum should be adopted, whereby children with defective eyes, or in more or less feeble health, should only be required to take as many and such studies as they may master in safety. Such a modified course, while it would lengthen the student life by one or more years, would do much toward preserving the eyes and general health.

A decided reform should also be made in the system of requiring study at home. The average school sessions of five or six hours a day should be sufficient to prepare for college by the time they are sixteen or eighteen without requiring nearly as many additional hours of study at home, which robs the student of the recreation and sleep he should have. The work at home is usually accomplished when the body is tired, and the brain sluggish, generally by artificial light (which is too often an improper one) and frequently with a faulty position of the body. We believe that with a proper regulation of recitation and study during school-hours alone, the brain, made more active by sufficient recreation, exercise and sleep outside, will accomplish far more than by the present system.

The paper and type used in school-books have in recent years been vastly improved, yet there is room for still further improvement. In selecting books for children, the type should always be large, bold and clear. Cohn and Weber claim that type at least

one and a half millimetres in height (equal to long primer) is the smallest that should be used in school-books, and the distance between the lines, or leading as it is called, should be two and a half millimetres. The paper should be of a dull finish, instead of the highly glazed finish of many books, and of a dead white or a cream color. In many of the books used by children the print is too small and of a poor impression, which is very injurious to the eyes. This perhaps applies more particularly to the interesting books and periodicals prepared for the young, and especially to newspapers. The character and the amount of reading is too often not properly regulated at home. The reading of sensational papers and novels at hours when the child should be at sleep is a habit too freely indulged at the expense of both mental and physical development.

There should also be frequent breaks in the application of the eyes at close work. This frequent interval of rest for both the brain and the eyes can easily be secured in the school-room by a change from the books to the blackboard, to oral instruction, lectures, etc. The school session should be broken by short recesses in the open air, gymnastic exercises, etc.

The system of examination, usually followed in schools, we believe, can be modified with benefit to the eyes and health of the pupil. The present method of frequent set examinations for promotions results in an unusual amount of study, or cramming, for a given time previous to the examination. This additional amount of study is always secured, at the expense of the eyes and health by taking the time from the already too limited hours given up to recreation and rest. All educators recognize that "cramming" is not the best method of learning, and yet the prevalent system of examinations leads to this. We would suggest that a better method to determine the true standing of the pupil would be by unexpected examinations, or by allowing the standing and fitness for promotion to rest upon the marks for daily recitations and the teacher's estimate of the pupil.

*The Construction of School Buildings.*—A consideration of the eyes and health of our school-children must necessarily involve the location of the building, as to surroundings, light, etc., and the school furniture.

The location in cities should avoid narrow streets, and high sur-



rounding buildings, which interfere both with light and air; and away from noises, exhalations, smoke and dust of factories, stables, markets, etc. Play-grounds in the open air, either in ample grounds or on the roof of the building, should be provided for intermission of the sessions. The building should be so constructed as to avoid dampness and should furnish ample ventilation without draughts. In the country, especially, care should be taken that the location be well drained and away from malarial and other injurious environments.

Sufficient light is of the utmost importance, and should be first considered in the architectural plan of all school-houses. The quantity of light, Cohn says, cannot be too much, while Javal says that every portion of the room should be so flooded with light that the darkest place will have sufficient illumination on a dark day. To secure this, Javal says that the distance of surrounding structures should be twice their height. The necessity of sufficient light is shown by an attempt to read in the twilight or in a dimly-lighted room. A test as to the amount of light is the ability of a normal eye to read diamond type readily at twelve inches. According to Risley the window surface should never fall below one square foot of glass for every five square feet of floor space, and that this should be exceeded in many localities, on the north side of buildings and on the ground floors. The quantity of the light is, of course, modified by the color of the walls in the school-rooms. The light shades of yellow, green, blue or gray should be used in the coloring of the walls and also of the furniture and wood-work. The loss of light caused by large surfaces of blackboards can be saved by roller shades, of the same color as the walls, to be lowered when not in use.

Next in importance to the quantity of the light is its direction. The ideal light of the school-room is that from the left side, or the left and the rear, of the pupils. Lighting of the room from two opposite sides should be avoided if possible, yet when necessary to secure the requisite amount of light that from the right side should be high up in the room. In this way we secure a diffused light in the room from the illumination of the ceiling and avoid the objectionable cross-lights. This arrangement at the same time affords better means of ventilation.



*School Furniture.*—In the most excellent and thorough article upon School Hygiene, by Dr. S. D. Risley,\* to which we are greatly indebted in the preparation of this chapter, much space has been devoted to the consideration of the school furniture. While the faulty construction of the school desk and seat is a very important factor, according to orthopædic surgeons, in the causation of spinal curvature, it has, and undoubtedly still is no small factor in the increasing myopia of school life. Vast improvements have been made in the average school-rooms of to-day in this respect, still a visit to almost any school will show more or less of the pupils in an improper position. The grave danger to the eyes lies in the pupil bending over his desk and thus bringing the eyes too close to the work. This abnormal near point adds greatly to the strain upon the accommodation and convergence, and at the same time causes an increased congestion of the coats of the eye, all of which serves to increase the tendency to near-sightedness. The proper arrangement of the seat and desk is such that the child will find it easier to sit upright at his work than in any other position he can assume. The directions and measurements for securing such a position by means of a correct seat and desk are fully given in the article referred to.

The blackboard forms an important adjunct to school life, and its more general and extended use should be encouraged. The strain upon the eyes is much less when looking at a relatively distant object like the blackboard than it is at the near point, as in reading and writing. Hence instruction by board exercises is much less fatiguing than work done with the pencil or pen. The surface of the board should be kept black and clean by frequent washing, and the crayons used should be either white or yellow. Wall maps and charts are also useful, for the same reason as the blackboard, in that they permit of instruction at a greater distance. The character of the type, paper, etc., in school-books has already been referred to.

In all children who have already developed near-sight, to avoid the increasing tendency to draw the work nearer and nearer to the eyes, some of the many forms of head rest, which hold the head erect and at the proper distance from the work, should be used.

In considering the subject of hygiene of the eye we have dwelt

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\*System of Diseases of the Eye. Norris and Oliver. Vol. II. 1897.

at length upon the care of the eyes in children, because it is at this time of life that the greatest danger to vision exists. Furthermore, when the proper care has been given to the eyes in early life we enter adult life with better eyes and a better understanding of their requirements. In all classes, men, women and children, there is an inherent prejudice to the use of glasses, but to those suffering from refractive errors the use of the correct glass is one of the greatest boons to humanity. We acknowledge that the prevalent error of all oculists is the too early and frequent prescribing of glasses. In many instances the use of glasses can be avoided by the correction of some deficiency in the balance of the extrinsic muscles of the eyes which is the cause of the asthenopic or reflex symptoms. In all cases of decided refractive errors, however, the use of correcting lenses is a necessity. When glasses are required they should be given proper care by the wearer. We have often seen patients wearing glasses so scratched and dirty that a great effort must necessarily be made to see through them. In using eye-glasses, they should never be folded, as they soon become misshapen or scratched. For the same reason glasses should not be thrown carelessly upon tables, stands, etc., and when out of shape, nicked and scratched they should be repaired or new ones purchased. After the correct lens has been selected care should be taken that the frames are correctly adjusted by a competent optician, as oftentimes improperly fitted frames destroy all the benefit that would have resulted from the glasses. The too common custom of allowing incompetent opticians, jewellers, peddlers, etc., to examine the eyes and fit glasses cannot be too strongly reprimanded.

The prevalent habit of going without glasses for reading as long as possible is also a bad one. The public should be taught that all normal eyes require glasses for near vision about the age of forty or forty-five. That postponing their use later than this age causes an effort of the accommodation which does harm. The prejudice to the use of glasses seems to be dying out, and the laity are realizing more and more the necessity of attention to the eyes.

One of the most important questions relating to the general care of the eyes is that as to the best light. This should always be answered, the diffuse natural light of day, and the next best,

that which most nearly approaches daylight. Artificial light should be profuse, white and steady and that which most nearly meets these requirements is that known as the Welsbach light. The incandescent light, when protected by translucent globes, is also an excellent light. Gas and kerosene are also good, but should be shaded with globes colored white on the inside and tinted green on the outside. What has been said in regard to children in school applies as well to the adult, that the use of the eyes should only be when the body is in the erect position, and that the light should fall upon the book or paper from the left side. It hardly seems necessary to caution against the use of the eyes in reading after twilight, when the illumination has become poor, when riding on the cars, while lying down, etc., but as all these things are being done daily we cannot cry don't too often.

In conclusion let us remind the reader that the health of the eye depends to a great measure upon the condition of the general system. The eye is not a separate and distinct organ, to be treated wholly independent of the general bodily health. While the eye can undoubtedly cause abnormal conditions of other organs, it can at the same time suffer from other diseased conditions. Therefore, by obeying the general laws of hygiene the usefulness of the eyes will be best maintained.

## CHAPTER VI.

**A Tabulated Statement of Diseases With More or Less Characteristic Eye Symptoms.**

From The Eye as an Aid in General Diagnosis by E. H. Linnell, M. D.

*Abdominal growths.*—More or less pigmentation of the skin of the eyelids.

*Addison's disease of the supra-renal capsules.*—Pigmentation of the skin of the lids and of the sclera.

*Albuminuria.*—Retinitis and neuro-retinitis.

*Alcoholism.*—Paretic mydriasis. Paralysis of accommodation, or spastic myosis in the early excitable stage. Paralysis of the external ocular muscles. Ptosis.

*Anæmia (Cerebral).*—Paretic mydriasis.

*Anæmia (Constitutional).*—Paralysis of accommodation, choroditis, retinitis and retinal hæmorrhages.

*Aneurism of orbital artery, or internal carotid.*—Exophthalmus.

*Aneurism of aorta and arteria innominata.*—Reflex spastic mydriasis on the side of the lesion. Retinal pulsation.

*Apoplexy.*—Dilation or contraction of the pupils distinguishes it from embolism, in which the pupils are unaffected. Spastic myosis in premonitory stage. When, during a seizure, mydriasis occurs after a previous myosis, it is an unfavorable symptom, signifying increasing pressure. Nystagmus. Homonymous hemianopsia.

*Apoplexy of cortex or corona radiata.*—Eyes and extremities paralyzed on the same side. Eyes deviate toward the side of the lesion.

*Apoplexy of the crus or pons varolii.*—Eyes and extremities paralyzed on opposite sides. Eyes deviate away from the side on which the lesion exists.

*Apoplexy of the pons.*—Spastic myosis.

*Apoplexy of ventricles.*—Spastic myosis.

*Atheroma*.—Conjunctival hæmorrhage. Intra-ocular hæmorrhages.

*Atrophy, progressive, muscular*.—Ocular paralyses.

*Basedow's disease or exophthalmic goitre*.—Diminished frequency of winking. Spasm of the levator of the upper lid. (Abadie's sign.) Widening of the palpebral fissure, owing to contraction of Mueller's muscle. (Stellwag's or Dalrymple's sign.) Loss of associated movement of the upper lid and the eye-ball. (Von Graefe's sign.) Exophthalmus.

*Brain, abscess of*.—Neuritis.

*Brain, basilar affections of*.—Loss of pupillary reflexes. Homonymous hemianopsia. Paralyses of ocular muscles.

*Brain, cerebral cortical affections*.—Conjugate ocular paralyses (or ophthalmoplegias), loss of voluntary movements of the eyes, with preservation of involuntary or reflex movements of pupil and eye-ball. Eyes paralyzed on side opposite the cerebral lesion. Eyes deviate towards side of lesion. Psychic visual disorder.

*Brain, cerebral affections, with increased intra-cranial pressure*.—Paretic mydriasis ordinarily. Sometimes reflex spastic mydriasis.

*Brain, cerebellum, affections of*.—Nystagmus.

*Brain, concussion of*.—Sluggish action of pupils without marked dilatation or contraction.

*Brain, hyperæmia of*.—Spastic myosis.

*Brain, tumor of*.—Nystagmus. Paretic mydriasis. *Choked disc. Choked neuritis*. Atrophy of optic nerve. Homonymous hemianopsia, when pressure is extended upon fibres of one tract.

*Cholera*.—Conjunctival hæmorrhage. Anæsthesia of cornea. Neuro-paralytic keratitis. Loss of the light reflex indicates a fatal termination even in apparently mild cases. Preservation of the light reflex warrants a favorable prognosis, even in severe cases. Black patches appear in the sclerotic below the cornea in severe cases. They are of irregular form and size and tend to coalesce. Their presence is of very unfavorable significance.

*Coma, alcoholic or uræmic*.—Mydriasis.



*Coma, syphilitic.*—Myosis and reflex iridoplegia.

*Death, signs of.*—Opacity and insensibility of the cornea. Dessiccation of the sclera. Abolition of pupillary reflexes. Absence of the red reflex from the fundus.

*Dental affections.*—Various forms of inflammation of the cornea. Nictitation.

*Diabetes.*—Eczema of the eyelids. Conjunctival hæmorrhage. Ulceration of the cornea. Paralysis of the external ocular muscles and of the accommodation. Cortical cataract. Retinitis and neuro-retinitis. Atrophy of the optic nerve. Degeneration of the retinal vessels and hæmorrhages. La-grange found, in 52 cases of diabetes, 13 of intra-ocular hæmorrhage and the same number of cases of cataract. (See "Arch. d' Ophth.," Jan., 1887.) Galezowski found, in 144 cases of diabetes, 5 of paresis of accommodation, 4 of keratitis, 7 of iritis, 4 of glaucoma, 46 of cataract, 27 of retinitis, 31 of amblyopia, 3 of amotio retinæ, and 3 of atrophy of the optic nerve. (See "Jahr. f. Aug.," 1883, p. 297.)

*Digestion, disorders of.*—Styes. Nictitation.

*Diphtheria.*—Diphtheritic conjunctivitis. Paralysis of the external eye muscles rare; of accommodation more frequent.

*Embolism, cerebral.* No pupillary symptoms; in contradistinction from apoplexy.

*Epilepsy.*—Paretic mydriasis during the seizure or spastic myosis. Hippus as consciousness returns and frequently during the intervals. Spasms of the ocular muscles.

*Fever, puerperal and typhoid.*—Metastatic suppurative choroiditis.

*Fever, relapsing.*—Iritis.

*Fifth nerve, affections of.*—Reflex spastic myosis.

*Fourth ventricle, lesions in.*—Nuclear ocular paralyses affecting separate nuclei of the third nerve, or successive implication of its various branches. Also total paralysis of all the muscles of both eyes.

*Friedreich's disease* (hereditary ataxia).—Nystagmus.

*Gout.*—Retinitis.

*Heart, aortic insufficiency.*—Alternate reddening and pallor of the optic disc.

*Heart, endocarditis.*—Embolism of the arteria centralis retinae.

*Heart, organic affections of.*—Œdema of lids. Venous hyperæmia of retina and pulsation retinal arteries. Seen with valvular affections, fatty heart and aortic insufficiency.

*Heart, hypertrophy of left ventricle.*—Retinal hæmorrhages.

*Heart, valvular lesions of.*—Retinal hæmorrhages.

*Helminthiasis.*—Reflex spastic mydriasis.

*Hepatic affections.*—Pigmentation of the skin of the lids. Coloration of sclera.

*Hydræmia.*—Œdema of lids.

*Hydrocephalus.*—Paretic mydriasis. Neuritis and atrophy of optic nerve.

*Hysteria.*—Chromidrosis. Epiphora. Ptosis. Spastic myosis (during a hysterical convulsion). Hippus. Hyperæsthesia of the retina. Spasm of accommodation. Amblyopia. Contraction of the visual field. Sudden onset, erratic course, sudden disappearance.

*Insanity.*—Monocular mydriasis and paralysis of accommodation are suspicious premonitory signs, as is also transient recurrent mydriasis.

*Kidney, diseases of.*—Degeneration of the retinal vessels with or without hæmorrhages. Retinitis and neuro-retinitis. Amblyopia. Œdema of lids.

*Leprosy.*—Leprous nodules in eyelids, conjunctiva, cornea and iris. Anæsthetic spots and white patches in the lids. According to Lopez ("Archiv. f. Aug.," xxii, 2 and 3) "the eye is affected in half the cases, the eye with its appendages in all cases." Knies.

*Lung, diseases of apex.*—Reflex spastic mydriasis.

*Malaria.*—Chronic superficial non-suppurative keratitis. Sensitiveness of supra-orbital nerves. Retinal hæmorrhages. Choroiditis.

*Mania.*—Reflex spastic mydriasis.

*Masturbation.*—Paralysis of accommodation. Hyperæsthesia of retina.

*Melancholia.*—Reflex spastic mydriasis.

*Meningitis, cerebral, acute.*—Mydriasis or myosis, photophobia. Injection of conjunctiva.

*Meningitis, cerebral, chronic.*—Interstitial and peri-neuritis. Atrophy of the optic nerve.

*Meningitis, of the convexity.*—Cortical blindness or hemianopsia with preserved pupillary light reflex. Hyperæsthesia of the retina. Photophobia, phosphenes, etc.

*Meningitis, cerebro-spinal.*—Eye symptoms frequent. Conjunctivitis in early stages. Later œdema of conjunctiva, denoting exudation in cranial cavity. Strabismus. Nystagmus. Spastic myosis in early stages. Reflex spastic mydriasis from pinching the skin at the back of the neck. (Parrot's sign.) Hippus. Choroiditis. Photophobia. Neuritis.

*Meningitis, spinal.*—Spastic mydriasis in the early stage.

*Meningitis, tubercular.*—Strabismus. Nystagmus. Ocular paralyses. Spastic myosis in early stage. Rapid alternation of myosis and mydriasis. Paretic mydriasis in later stages in contra-distinction from cerebro-spinal meningitis, in which it is rare. Tuberculosis of the choroid. Homonymous hemianopsia.

*Meningeal hæmorrhage.*—Nystagmus. Hemianopsia.

*Menstruation, disorders of.*—Styes.

*Myelitis, acute and chronic.*—Neuritis or simple atrophy of the optic nerve.

*Myxœdema.*—Thickening and swelling of the lids.

*Nephritis.*—See diseases of the kidney.

*Neuralgia of the fifth nerve.*—Paralysis of accommodation.

*Neuritis, multiple or pseudo-tabes.*—Axial neuritis with central scotoma. Absence of pupillary symptoms, in contra-distinction from true tabes.

*Nicotine poisoning.*—Spastic myosis. Retro-bulbar neuritis with central scotoma.

*Paralysis agitans.*—Tremor of the lids. Ptosis.

*Paralysis, general (paralysis of insane, paresis).*—Monocular mydriasis and paralysis of the accommodation and transient recurrent mydriasis are suspicious premonitory symptoms. Paretic mydriasis is an early symptom. The "Argyll-

Robertson pupil," is found in fifty per cent. of the cases. Anisocoræa. Paretic myosis. Optic-neuritis. Atrophy of optic nerve. Sudden blindness. Sudden development and transient duration of ocular symptoms, similar to multiple sclerosis and tabes.

*Polio encephalitis superior* (inflammation of the floor of the fourth ventricle).—Progressive paralysis of the ocular muscles is the essential feature.

*Pons varolii, lesions of.*—Nystagmus. Associate ocular paralysis in horizontal lines. Spastic myosis. An isolated lesion for one side produces paralysis of the external rectus on the same side.

*Pyæmia.*—Metastatic suppurative choroiditis. Retinal hæmorrhages.

*Rachitis.*—Cortical or laminated cataract.

*Rheumatism.*—Paralysis of external ocular muscles, usually of one eye, and affecting one or more contiguous branches of the nerve such as the superior rectus and levator palpebræ superioris. Iritis with gelatinous exudation.

*Sclerosis, multiple.*—Nystagmus, a frequent and valuable diagnostic sign. Ocular paralysis characterized by sudden development, transient duration and variable course, similar to syphilis and tabes. Hippus. Paralysis of accommodation. Impairment of vision, but rarely complete blindness. Central scotoma. Irregular or concentric contraction of the visual field. Neuritis.

*Scrofula.*—Eczema of lids. Styes. Ciliary blepharitis. Conjunctivitis. Pustules and abscesses of the cornea. Phlyctenular conjunctivitis and keratitis. Choroiditis.

*Snake poisoning.*—Retinal hæmorrhages.

*Skin, extensive burns of.*—Reflex spastic mydriasis (skin reflex).

*Spinal cord, inflammation and congestion of, spinal irritation.*—Spastic mydriasis occurs in the early stages.

*Spinal cord, degenerative disease of.*—Nystagmus.

*Syphilis.*—Every tissue of the eye, except the lens, is affected. Inflammation of the lids, orbit and lachrymal passages. Arrest of development, such as microphthalmus, etc., in the



congenital form. Periostitis and caries of the orbit. Paralytic affections of the lids and external ocular muscles. Various muscles are suddenly, successively and transiently involved. Parenchymatous keratitis. Inflammation of the sclera with gummata. Mydriasis with loss of accommodation. Gummous iritis. Choroiditis. Degeneration of the retinal vessels with or without hæmorrhages. Retinitis and neuro-retinitis. Atrophy of the optic nerve. Heteronymous and homonymous hemianopsia. Zimmerman, of Milwaukee, says, in "Knapp's Archives," January, 1895, that only about 15 per cent. of the cases of brain syphilis are without ocular symptoms.

*Tabes.*—Anæsthesia of the skin of the lids, of the conjunctiva and cornea, with false localization of sensation. Paresis of orbicularis palpebrarum. Narrowing of the palpebral fissure. Ptosis. Paralysis of the ocular muscles, sudden in development and transient in duration, similar to syphilitic paralyses and to those which occur in multiple sclerosis. Spastic mydriasis may be a premonitory symptom. Paretic myosis occurs in 23 per cent. of the cases. The "Argyll-Robertson pupil" is a very characteristic symptom, and occurs in 70 per cent. of the cases. In 25 per cent. it is an early symptom. Reflex iridoplegia, or failure of all the pupillary reflexes. The reaction to light fails first, followed by loss of reaction with accommodation and convergence, and lastly the skin reflex is lost. Anisocoria occurs in 34 per cent. of the cases. Reflex iridoplegia is a valuable diagnostic point between true and false tabes, or multiple neuritis. In the latter, myosis and reflex iridoplegia are wanting. Atrophy of the optic nerve. Ocular symptoms may appear very early, even many years before the ataxic symptoms. Gowers relates a case where twenty years elapsed between blindness, optic nerve atrophy, etc., and the onset of ataxia. *When spinal symptoms are well marked, ocular symptoms are often latent or absent, and the reverse is also true, viz., when ocular symptoms are marked the spinal symptoms are slight or absent and may be long delayed.*

*Trichinosis.*—Œdema of the lids and paralysis of accommodation.



*Tuberculosis*.—Periostitis and caries of the orbit. Tubercular nodules in eyelids, conjunctiva, iris and choroid. Iritis with grayish-red nodules.

*Typhoid fever*.—Anæsthesia of the cornea, neuro-paralytic keratitis. Hippus in stage of cerebral manifestations. Metastatic suppurative choroiditis. Intra-ocular hæmorrhages.

*Uræmia*.—Mydriasis is a premonitory sign. Sudden failure of vision.

*Uterine affections*.—Pigmentation of the skin of the lids. Paralysis of accommodation.

*Urticaria*.—Reflex spastic mydriasis.

## CHAPTER VII.

## Diseases of the Eyelids.

**Anatomy.**—The eyelids form the external covering of the eyeballs, and serve to protect the eye from injury, both from excessive light and foreign substances; they also serve at the same time to distribute to the eyes the moisture secreted by the various glands.

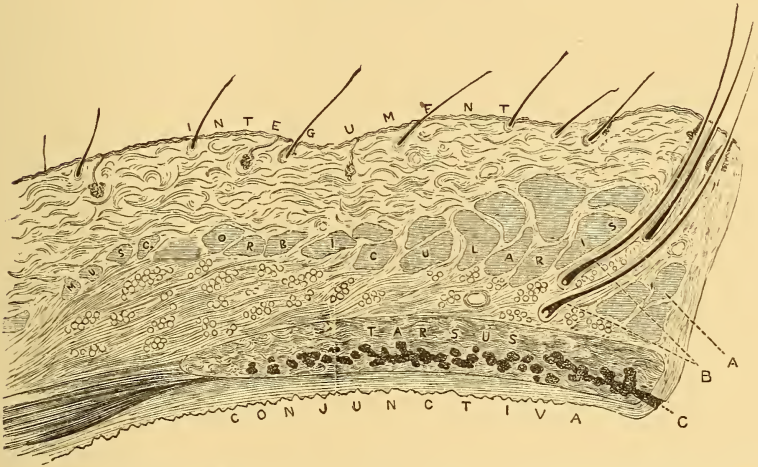
The eyelids, or palpebræ, are two thin movable folds, the upper being the larger and more movable of the two; their movement is both voluntary and involuntary, the latter action being due to the orbicularis muscle. The opening of the lids is chiefly by the action of the levator palpebræ superioris lifting the upper lid; when opened an elliptical space is left between the margins of the lids; this opening varies greatly, being larger in prominent eyes than in sunken ones, and greater when looking upward. The angles of junction of the upper and lower lids are called *canthi*; the *outer canthus* is more acute than the inner; near the extremity of the *inner canthus* is found on both the upper and lower lid a slight elevation, the apex of which is pierced by a small orifice, the *punctum lachrymale*, the commencement of the small channel or *canaliculus* leading to the tear sac.

The eyelids are composed of four layers, arranged from without inward in the following order, the integument, a layer of muscular fibres, the tarsus, or as often erroneously called the tarsal cartilage, and the conjunctiva. The *integument*, which is extremely thin but similar in every other respect to the integument elsewhere, becomes, at the margin of the lids, continuous with the conjunctiva. Beneath the skin the connective tissue is loose and contains no fat.

The muscular fibres consist of the *orbicularis palpebrarum*, a large flat, voluntary muscle extending over the orbital margins above and below and terminating by tendinous attachments at the angles of the lids, the tendons, together with some fibres of the muscle, being inserted in the adjacent bony wall. The fibres of

the orbicularis which lie upon the tarsi are paler than the others, and certain bundles of these which give to the lid its involuntary action, are known as the ciliary muscles of Riolarani. The orbicularis is somewhat adherent to the skin, but glides loosely over the tarsus. It receives its nerve supply from the facial. Its fibres being more or less circular in arrangement, and, acting as a sphincter, serve to close the eyes.

FIG. 30.



Section through upper eyelid. *A*, the ciliary muscle of Riolarani; *B*, follicle of the eye-lashes; *C*, opening of the Meibomian follicles.

The *levator palpebræ superioris* arises at the apex of the orbit, and passing along its upper wall becomes intermingled in front of the tarsus with the orbicularis; other fibres become attached to the upper edge of the tarsus, and still others go to the conjunctiva. This muscle is supplied by a branch from the third nerve, and its action is, as its name implies, to raise the upper lid. The lower lid is supplied with a prolongation from the inferior rectus, whose insertion and action is analogous to that of the levator palpebræ.

The *tarsi* are two thin, elongated plates composed of condensed fibrous tissue, and serve to form the framework of the lids; they are united to each other and to the adjacent bone through the medium of the internal and external lateral ligaments.

The *conjunctiva* is a delicate mucous membrane which commences at the free border of the lid, where it is continuous with

the skin; it lines the inner surface of the lids and is then reflected upon the globe, over which it passes and becomes continuous with the cornea. The palpebral portion is thicker and more vascular than that covering the globe, and is firmly attached to the tarsus. Where it passes from the lids to the globe it is thin and loose, and forms what are called the *fornix conjunctivæ*. The *plica semilunaris* is a verticle fold of conjunctiva at the inner canthus, and the reddish elevation at the inner angle is called the *caruncula lachrymalis*.

The *cilia* are short, thick, curved hairs, arranged in double or triple rows at the margins of the lids; their follicles are surrounded by sebaceous glands and the glands of Moll. Within the tarsus are embedded the Meibomian glands, which in structure resemble the sebaceous glands. These various glands by their secretions serve to lubricate the eye, and discharge their secretion through excretory ducts, opening by minute orifices upon the free border of the lids between the rows of cilia.

**Blepharitis.**—(*Blepharitis Simplex, Blepharo-Adenitis, Blepharitis Ciliaris, Blepharitis Marginalis, Seborrhœa; Blepharitis Ulcerosa, Blepharitis Hypertrophica, or Squamosa.*) Under this general heading, inflammation of the lids, we shall group the various clinical sub-divisions. The numerous names (of which the above are but few) that have been given to an inflammation involving the border of the eyelids may be all grouped under two headings—non-ulcerative and ulcerative blepharitis.

**SYMPTOMS.**—The non-ulcerative form commences as a simple hyperæmia of the lid border, which gives to the lids a red, swollen appearance. This is accompanied by a slight burning and smarting in the eyelids, which is aggravated by cold winds, smoke, dust, exposure to bright light, or use of the eyes at close work. There is agglutination of the eyelids in the morning, with dry scales or scabs adhering to the margins of the lids, and more or less photophobia and lachrymation are present. This variety depends upon an abnormal secretion of the sebaceous glands

The ulcerative variety may be considered as an extension of the preceding form. If we remove with the forceps the yellow crusts surrounding and embedding the cilia, which have formed through neglect in the previous stage, we find a red, bleeding ulcerative surface. This surface continues to secrete pus that forms other



crusts, and by extension of the ulceration the entire edge of the lid may become involved. At this stage the disease is known as *blepharitis ulcerosa*, and as it advances the edge of the lid not only becomes red and covered with scales, but considerably thickened, and it is then termed *blepharitis hypertrophica*. If the disease still continues unchecked, it involves the hair follicles and causes the lashes to become stunted and misplaced (*trichiasis*), or to fall out, and when entirely wanting we have the condition known as (*madarosis*). The final stage of the disease is when the lid itself becomes rounded, red, thickened, everted and deprived of lashes (*lippitudo*).

COURSE.—The course of the disease is usually very chronic, and yet should be cured by thorough and prolonged treatment.

CAUSES.—The disease is especially the result of refractive errors in young, delicate persons of a strumous diathesis. As the causes are so closely associated with the treatment, they will be considered further under that heading.

TREATMENT.—First, we should examine the refraction, and, if any error is found, correct the same with the proper glass, as in many cases this alone will cure the entire trouble.

In rare cases the presence of lice on the eyelashes may be the exciting cause (*phthiriasis ciliarum*), when we should be careful to remove them and apply either cosmoline or some mercurial ointment, which will destroy them and prevent their recurrence.

Fungous growths in the hair follicles are also said to cause this disease, in which case the hairs should be extirpated, and either external or internal medication employed.

Another cause is frequently found in affections of the lachrymal canal, particularly catarrh of the lachrymal sac and stricture of the duct; in these cases the tears, being hindered from flowing through their natural passage into the nose, collect in the eye, flow over the lids and down the cheek; thus the retention of the tears will cause an inflammation of the margins and eventually of the whole structure of the lids. Any other affection which will have the same result (flowing of the tears over the lids) will, of course, produce the same trouble, and this is often found in slight degrees of eversion of the lower lids (*ectropium*), which displaces the puncta lachrymalis and thus prevents the tears from passing into the sac. In all such cases the first thing



to be done is to open the canaliculus into the sac, and, if necessary, the nasal duct into the nose, so as to give a free passage for the tears into that organ, after which the treatment is the same as in uncomplicated cases.

But the most common causes of ciliary blepharitis are exposure to wind, dust, smoke, etc., especially when complicated with *want of cleanliness*; it is for this reason we see this trouble so frequently among the poorer classes. As it is upon this point—cleanliness—that the success of our treatment depends to a great extent, we should impress upon the patient's mind the necessity of it in terms as forcible as possible.

They should be directed to remove the scales or crusts from the margins of the lids *as soon as formed*, not allowing them to remain even a few minutes. This should not be done by rubbing, as the patient is inclined to do on account of the itching sensation, for by so doing excoriations are made, lymph is thrown out and new scabs form, which only aggravate the inflammation. But they should be directed to moisten the crusts in warm water and then carefully remove them with a piece of fine linen, or by drawing the cilia between the thumb and fingers; at the same time gentle traction may be made on the lashes, so as to remove all that are loose, as they act only as foreign bodies. Sometimes the scabs are so thick and firm that moistening in warm water is not sufficient to remove them; in such cases, hot compresses or poultices should be applied for ten or twenty minutes at a time, until they can be easily taken away.

In the treatment of *chronic* inflammation of the margins of the lids, *external applications* are of great value and without their use a cure is often impossible. It is true that a careful attention to cleanliness, together with the internal administration of the indicated remedy, will cure a large proportion of the cases, but the duration of treatment will be usually much longer than if we employ local means at the same time we give internal remedies.

**Cosmoline or Vaseline.**—This unguent has been of great service in the treatment of blepharitis. It may be used alone or to form a base for the administration of other remedies. It prevents the formation of new scales and the agglutination of the lids, besides seeming to exert a beneficial influence over the progress of the disease. This, like all other ointments, should be

used once or twice a day, or even oftener, if the case is very severe. All scales or crusts should be carefully removed; after which a very little of the ointment may be applied to the edge of the lids with the finger or a camel's hair brush. The smallest amount possible, to oil the ciliary margins of the lids, should be applied, as an aggravation of the inflammation may result from its too free use.

**Mercury.**—For years this has been a favorite local application in blepharitis. It seems to be better adapted to the severe forms of inflammation of the lids than Graphites, for there is more redness, more swelling, more secretion and more tendency toward ulceration. The two following prescriptions have been employed with the most favorable results, especially the yellow oxide:

- ℞. Hydrarg. oxyd. flav., . . . . . gr. ij.  
 Vaselin, . . . . . ʒij.  
 Misce.
- ℞. Liq. Hydrarg. nitr., . . . . . gtt. iij.  
 Vaselin, . . . . . ʒij.  
 Misce.

In some cases more of the mercury is used, in others less, according to the severity of the symptoms.

**Grapho-vaseline.**—Graphites, as will be seen in the symptomatology, is more commonly indicated in blepharitis than any other one remedy. Many cures have resulted from its internal administration alone, when indicated, but more brilliant results may be obtained by employing at the same time locally the following unguentum:

- ℞. Graphites, . . . . . gr. ij.  
 Vaselin, . . . . . ʒij.  
 Misce.

Various other ointments and washes have been used with variable success. The use of milk, cream, lard and simple cerate, to prevent the lids from sticking together, have also been of aid, with internal medication.

**Graphites.**—This is one of the most important remedies we possess for the chronic form of this disease, though it may be indicated in acute attacks, especially if complicated with ulcers or pustules on the cornea. Particularly useful if the inflammation occurs in scrofulous subjects covered with *eczematous eruptions*

chiefly on the head and *behind the ears; which are moist, fissured and bleed easily.* The edges of the lids are slightly swollen, of a pale red color and covered with *dry scales or scurfs*, or the margins may be ulcerated. The inflammation may be confined to the canthi, especially the *outer, which have a great tendency to crack and bleed, upon any attempt to open the lids.* Burning and dryness of the lids are often present, also biting, and *itching*, causing a constant desire to rub them. It is important in *eczema of the lids*, if the eruption is moist, with tendency to crack, while the margins are covered with scales or crusts.

**Mercurius sol.**—Very favorable results have been gained by this remedy in blepharitis, especially if dependent upon or found in a *syphilitic subject*, or if caused from working over *fires or forges.* *The lids are thick, red, swollen and ulcerated* (particularly the upper) *and sensitive to heat or cold and to touch.* *Profuse acrid lachrymation* is usually present, which makes the lids sore, red and painful, especially worse in the open air or by the constant application of cold water. *All the symptoms are worse in the evening after going to bed and from warmth in general*, also from the glare of a fire or any artificial light. The concomitant symptoms should receive special attention, as excoriation of the nose from the acrid coryza, flabby condition of the tongue, nocturnal pains, etc., etc.

**Hepar sulph.**—This is the remedy most frequently employed in acute phlegmonous inflammation, especially after the first stage has passed *and suppuration is about to, or has already, taken place.* The lids are inflamed, as if erysipelas had invaded them, with *throbbing*, aching, stinging pains, and *very sensitive to touch*; the pains are aggravated by cold and from contact, but *ameliorated by warmth.* It may also be useful in certain forms of blepharitis in which the lids are inflamed, sore and corroded, as if eaten out, or if small red swellings are found along the margins of the lids, which are painful in the evening and *upon touch.* There is *general amelioration from warmth.* Often called for when the Meibomian glands are affected. For *eczema palpebrarum*, in which the scabs are thick and honeycombed in character on and around the lids, it is very valuable.

**Pulsatilla.**—Blepharitis, both acute and chronic, especially if the glands of the lids are affected (blepharo-adenitis) or when

there is a great tendency to the formation of *styes* or abscesses on the margin of the palpebræ. Blepharitis resulting from high living or fat food and when accompanied by acne of the face; also in cases in which the lachrymal passages are involved. The swelling, redness and discharges vary, though the latter are more often *profuse and bland*, causing agglutination of the lids in the morning. *Itching and burning* are the chief sensations experienced. The symptoms are usually *aggravated in the evening*, in a warm room or in a cold draught of air, but *ameliorated in the cool open air*.

**Calcarea carb.**—Blepharitis occurring in persons inclined to grow fat, or in *unhealthy*, "*pot-bellied*" children of a scrofulous diathesis who sweat much about the head. The lids are red, swollen and *indurated*. Inflammation of the margins of the lids, causing loss of the eyelashes, with thick, purulent, excoriating discharge and burning, sticking pains. *Great itching* and burning of the margins of the lids, particularly at the canthi; throbbing pain in the lids. Most of the eye symptoms are worse in the morning, on moving the eyes, and in *damp weather*. Great reliance should be placed on the general cachexia of the patient.

**Calcarea iod.**—Seems to act better than the carbonate in blepharitis found in those unhealthy children afflicted with *enlargement of the glands and especially of the tonsils*.

**Rhus tox.**—Its chief use is in acute phlegmonous inflammation of the lids and erysipelas; lids œdematously swollen (especially the upper) and accompanied by *profuse lachrymation*; there may be *erysipelatous swelling* of the lids, with vesicles on the skin; *chemosis* is often present. The pains are worse at night, and in cold, damp weather, but relieved by warm applications. It may be of service in acute aggravations of chronic inflammation from exposure in wet weather or when worse at that time, with much *swelling of the lids* and *profuse lachrymation*.

**Mezereum.**—Blepharitis accompanied by tinea capitis; or *eczema of the lids* and head, characterized by *thick hard scabs*, from under which pus exudes on pressure.

**Antimonium crud.**—Obstinate cases in which the lids are red, swollen and moist, with pustules on the face. Especially in cross children. *Pustules on the ciliary margins*.

**Arsenicum.**—Inflammation of the margins of the lids, which



are *thick, red and excoriated by the burning, acrid lachrymation*. The cheek may also be excoriated. The lids are sometimes œdematously swollen and spasmodically closed, especially when the cornea is at the same time affected. The *characteristic burning pains* are important and usually present. The general condition of the patient decides us in the selection, as the great prostration, restlessness, aggravation after midnight and thirst are commonly seen in scofulous children. Often useful in the early stages of abscess of the lids.

**Sulphur.**—A remedy called for, especially in the chronic form of this disease and when found in children of a strumous diathesis who are irritable and cross by day and restless and feverish by night; also for blepharitis appearing after the suppression of an eruption or when the patient is covered with eczema. The lids are red, swollen and agglutinated in the morning, or there may be numerous small itching pustules on the margins. The *pains are usually of a sticking character*, though we may have itching, biting, burning and a variety of other sensations in the lids. There is generally great aversion to water so that *they cannot bear to have the eyes washed*. Eczematous affections of the lids, like eczema in other portions of the body, which indicate Sulphur, are often controlled.

**Psorinum.**—Old chronic cases of inflammation of the lids, especially when subject to occasional exacerbations. It has also been of service in the acute variety when the internal surface of the lids was chiefly affected, with considerable photophobia. Particularly indicated in a *strumous diathesis*, with unhealthy, offensive discharges from the eyes.

**Aconite.**—Chiefly called for in the acute variety of this trouble, especially when caused from *exposure to cold dry winds* and in the *very first stage of abscess*. *The lids—especially the upper—are red and swollen, with a tight feeling in them, while great heat, dryness, burning and sensitiveness to air are present*; the dry heat is temporarily relieved by cold water. The conjunctiva is usually implicated.

**Alumina.**—Chronic inflammation of the lids (particularly if complicated with granulations), characterized by burning and dryness of the lids, especially in the evenings; *itching dryness, and excoriation at the canthi*. *Absence of lachrymation*. There is not



usually much destruction of tissue nor great thickening of the lids.

**Apis mel.**—Incipient stage of abscess, before the formation of pus, if there is *great puffiness of the lids, especially of the upper, with stinging pains*. Much reddish-blue swelling of the lids; temporary relief from cold water. There is often chemosis and the lachrymation is profuse, hot and burning (Rhus), though not acrid, as under Arsenicum. Drowsiness and absence of thirst are often present.

**Argentum nit.**—*Lids sore, very red and swollen*, especially when complicated with granular conjunctivitis or some other external trouble. There is usually *profuse discharge* from the eyes, causing firm agglutination in the morning. The symptoms are often *relieved in the cold air*, or by cold applications, and may be associated with headache, pain in the root of nose, etc.

**Aurum.**—Rarely useful in uncomplicated blepharitis, except when occurring in scrofulous or syphilitic subjects, after the abuse of Mercury. The lids may be red and ulcerated, with stinging, pricking or itching pain in them. Cilia rapidly fall out.

**Causticum.**—Blepharitis, with warts on the eyebrows and lids. The symptoms are ameliorated in the open air. *Feeling of sand in the eye*.

**Chamomilla.**—Of benefit as an intercurrent remedy, even if it does not complete the cure, in cross, peevish children who want to be carried. The local symptoms are not marked.

**Cinnabaris.**—Ciliary blepharitis, with *dull pain over or around the eye*. There may be dryness of the eye, or considerable discharge.

**Croton tig.**—When there is complicated with the blepharitis a *vesicular eruption on the lids and face*.

**Euphrasia.**—A valuable remedy if the lids are red, swollen and excoriated by the profuse, acrid, muco-purulent discharge, or even if ulcerated. The *lachrymation is also profuse, acrid and burning*; often accompanied by fluent coryza. The cheek around the eye is usually sore and red from the nature of the discharges.

**Mercurius corr.**—This form of Mercury differs very little in its symptomatology from the solubis, and that is chiefly in degree, *as the pains are generally more severe and spasmodic in character, lachrymation more profuse and acrid, secretions thinner and more*

*excoriating* and inflammatory swelling greater than in any other preparation. It has proved curative in inflammatory swelling of indurated lids; inflammatory swelling of cheeks and parts around the orbits, which are covered with small pustules, and especially in *scrofulous inflammation of the lids*. Nocturnal aggravation of the symptoms is usually present.

**Natrum mur.**—Ciliary blepharitis, particularly if caused by the use of caustics (nitrate of silver). The lids are thick and inflamed, smart and burn, with a feeling of sand in the eye. The lachrymation is acrid, excoriating the lids and cheeks, making them *glossy and shining*; often accompanied by eczema.

**Nux vom.**—Chronic inflammation of the lids, with smarting and dryness, especially *worse in the morning*. It is particularly indicated in blepharitis dependent upon gastric disturbances.

**Petroleum.**—Has been of benefit in blepharitis, especially if combined with the use of cosmoline externally. Great reliance should be placed on the occipital headache, rough skin, etc., generally found when this drug is indicated, though it has been used with advantage when no marked symptoms were present.

**Sepia.**—Chronic inflammation of the edges of the lids with scales on the cilia and *small pustules on the lid margins* (acne ciliaris). Feeling as if the lids were too heavy, or as if they were too tight and did not cover the ball. *Worse morning and evening*.

**Silicea.**—Blepharitis from working in a damp place or being in the cold air. (Calc., Rhus.) Indicated in abscesses, after suppuration has commenced. Silicea is more particularly called for in the carbuncular form, and especially if the patient is very nervous and the local symptoms are accompanied by sharp pains in the head, relieved by wrapping up warm.

**Staphisagria.**—Blepharitis, in which the margins of the lids are dry, with hard nodules on the borders and destruction of the hair follicles. Itching of the lids.

**Tellurium.**—Eczema of the lids, especially if complicated with a moist eruption behind the ears and *offensive otorrhœa* smelling like fish brine.

In addition to the above, the following remedies have also proved serviceable: Lycop., Merc. nitr., Merc. prot., Sang., Senega.

**Abscess of the Lid**—(*Phlegmon, Furuncle*).—Suppuration in the connective tissue of the lid is generally the result of trauma, and is then due to a breaking down of the blood-clot formed at the time of the contusion. It may also follow debilitating diseases, or be associated with adenitis in scrofulous children. There will be great swelling of the lid, with more or less heat, redness and pain. Fluctuation may be detected early, and inflammation of the conjunctiva is apt to be associated with this disease. General inflammation of the lid may sometimes be seen in children without suppuration; while in cachectic subjects we may have a gangrenous condition. Furuncle differs from abscess or phlegmon, in that it is less diffuse, less evidence of fluctuation and more necrosis of tissue.

**TREATMENT.**—By a careful selection of our remedy in the first stage, we can often cause the inflammation to subside before suppuration has taken place. It is also possible to promote the resolution and discharge of pus already formed. Cold (iced) applications are recommended if the disease is seen at the outset; but if we suspect that the formation of pus has commenced, a change to hot applications (poultices) should be made.

As soon as fluctuation can be felt, a free incision into the swelling parallel to the margin of the lids should be made, in order to give free vent to the confined pus. After the escape of the pus, warm applications of *Calendula* and water (ten drops to the ounce) are advised. A compress bandage should also be employed if the abscess is extensive, so as to keep the lid in position and the walls of the abscess in contact, and thus hasten the union.

If it has already spontaneously opened, the perforation should be enlarged, if it be insufficient and unfavorably situated; also if there be several apertures, they should be united by an incision, in order to leave as small a cicatrix as possible. A generous diet should be prescribed. For remedies, see *blepharitis* page 107.

**Hordeolum** (*Stye, Acne*).—Is an acute inflammation of the cellular tissue of the lid leading to suppuration and pointing at the edge of the lid. The location of the inflammation is usually in the tissue surrounding a hair follicle.

**SYMPTOMS.**—At first it appears as a hard, circumscribed redness and swelling, which frequently extends so that the whole lid will

become œdematously swollen. There is at first much severe throbbing pain. Occasionally there are two or more at the same time, and they often occur in successive crops.

**COURSE.**—They usually point and break in three or four days, though they may undergo absorption without breaking.

**CAUSES.**—It is especially found in young people, and is usually due to general debility, associated with overuse of the eyes; chronic blepharitis, or conjunctivitis and exposure to cold winds may cause it.

**TREATMENT.**—We are not often called upon to prescribe for a single sty, but usually to prevent the recurrence of successive crops. If the case is seen at its very outset cold compresses or dry heat will sometimes abort the attack; though usually more benefit is derived, especially after its commencement, from hot poultices.

If pus has formed, as shown by a yellow point, an incision should be made to permit its escape. If dependent, as it frequently is, upon impairment of the general health, proper hygienic measures must be advised.

**Pulsatilla.**—This is an excellent remedy for styes of every description and in every stage of the disease. If given early, before the formation of pus, it will often cause them to abort; if used later, relief from the pain and hastening of the process of cure is frequently produced, while, as a remedy for the prevention of the recurrence of successive crops, it is of great value. It is especially useful if *dependent upon some gastric derangement*, as from indulgence in high living, fat food, etc., and if *accompanied by acne of the face*; also when found in amenorrhœic females or the peculiar Pulsatilla temperament.

**Hepar.**—Indicated if suppuration has already commenced, with *throbbing pain, great sensitiveness to touch and amelioration by warmth*.

**Rhus tox.**—Useful in the early stages when there is an œdematous swelling of the lids, especially if associated with conjunctivitis and profuse lachrymation.

**Graphites.**—Useful in preventing the recurrence of styes. (Compare general symptoms of patient.)

**Staphisagria.**—Recurrence of styes, especially on the lower lid, which are inclined to abort and leave little hard nodules in the lids.



**Sulphur.**—To prevent the recurrence of successive crops, especially in a strumous diathesis, as shown by eruptions, boils, etc., on various portions of the body. Cannot bear to have the eyes washed, and is restless and feverish at night.

**Thuja.**—Obstinate forms of stytes, which seem to resist treatment and form little hard nodules on the margins of the lids.

The following remedies have also been recommended and used with advantage: Acon., Arsen., Calc., Caust., Con., Lyco., Merc., Pic. ac., Phosph. ac., and Silicea.

**Ptosis** is a drooping of the upper lid, due to either partial or complete paralysis of the levator palpebræ superioris. It may occur alone or be associated with a paralysis of the other muscles supplied by the third nerve, and is sometimes congenital. When complete, the upper lid covers nearly the whole of the cornea. The most frequent causes are syphilis, when of a central origin and trauma when peripheral. The so-called *spurious ptosis* is a drooping of the lid due to increased weight rather than to any diminished power of the levator muscle of the lid. This condition is found in thickening of the tissue from chronic trachoma, from new growths, etc. *Ptosis adiposa*, a condition in which a relaxed fold of the skin hangs down like a pouch over the free border of the lid when it is raised, also comes under this heading.

**TREATMENT.**—Chief reliance must be placed upon internal medication, though sometimes electricity proves of great value, either used alone or in connection with the indicated remedy. If the disease—dependent upon irremedial causes—resists all treatment, operative measures must be resorted to.

**Causticum.**—More benefit has probably been derived from this remedy in the treatment of ptosis than from any other. Its special indication is *drooping of the lid, resulting from exposure to cold* (Rhus, from damp cold). The symptoms in the provings very strongly point to Caust. as a remedy in this disorder, as “inclination to close the eyes; they close involuntarily. Sensation of heaviness in the upper lid, as if could not raise it easily,” etc.

**Rhus tox.**—Especially if found in a *rheumatic diathesis*, and if the cause can be traced to *working in the wet, getting the feet damp, or to change in the weather*. Heaviness and stiffness of the lids, like a paralysis, as if it were difficult to move them. There



may be aching, drawing pains in the head and face, or they may be absent. The concomitant symptoms will point to its selection, though it has proved useful when none are present.

**Alumina.**—The upper lids are weak, seem to hang down as if paralyzed, especially the left. *Burning dryness* in the eyes, especially on looking up. *Absence of lachrymation.* Particularly useful for loss of power in the upper lids *met with in old, dry cases of granulations.*

**Euphrasia.**—If caused from exposure to cold and wet and accompanied by catarrhal symptoms of the conjunctiva.

**Ledum.**—Ptosis resulting from an injury, with ecchymosis of the lids and conjunctiva.

**Spigelia.**—Ptosis, resulting from inflammation or other causes, in which *sharp, stabbing pains through the eye* are present. Sometimes hot, scalding lachrymation accompanies the above.

*Gelsemium, Stannum and Conium* have been favorably employed in this affection, especially the former. (Compare paralysis of the muscles.)

Many operative measures have been recommended for the relief of *Ptosis*. The old method was simply the removal of a portion of the skin and fibres of the obicularis muscle, and this, in some cases of partial ptosis, may suffice.

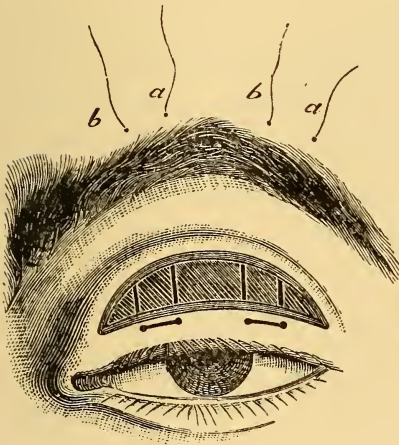
Pagenstecher, in 1881, introduced the operation of inserting subcutaneous sutures, running from near the margin of the lid to the forehead above the brow, and tied tightly, expecting by the resulting cicatrices, as the sutures cut their way out, to raise the lid.

Wecker combines the operation of sutures with the old method of excision, as follows: He removes an elliptical portion of the skin and muscular fibres. He then inserts a strong thread above the brow, running underneath the skin to the upper edge of the wound, over which it passes to the lower border of the wound and then pierces the skin near the free border of the lid; it is now carried parallel to the lid for about five millimetres, where the puncture is again made, and it travels backward on a reverse course, parallel to its downward path, to the brow. The two ends are now tied together over a roll of plaster and tightened from time to time as they become loose (Figs. 31 and 32). Two such sutures are introduced. The wound is in this way closed,

and, as the sutures cut through, cicatrices are formed which hold the lid up permanently.

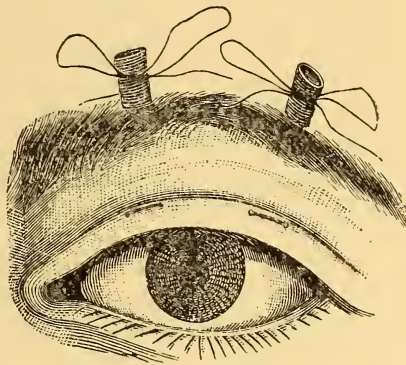
In addition to the operations described Birnbacher makes an operation to connect the tarsus with the frontalis by cicatrices. He passes three sutures through the upper border of the tarsus up under the skin and out in the eyebrow, where they are tied over a roll of lint and left in place for three weeks. Panas endeavors to bring about a union between the lid and frontalis muscle by fastening a flap from the lid to the skin of the forehead. Eversbusch and Hugo Wolff both propose an operation for congenital ptosis to increase the power of the levator by advancing its insertion.

FIG. 31.



Wecker's operation for ptosis.

FIG. 32.



Wecker's operation (completed).

**Blepharospasm.**—Spasmodic closure of the lids, due to reflex irritation of the ophthalmic division of the fifth nerve, is often dependent upon some conjunctival irritation, or it may be due to a foreign body, an ulcer of the cornea, iritis, refractive errors, carious teeth, hysteria, or other reflex conditions. The spasm of the lid may be of the *tonic* variety, in which there is continued and complete closure of the lids, with perhaps an inversion of the eyelashes, which will of course cause great irritation of the eye. In obscure cases where no lesion of the eye itself can be found search should be made for "pressure points," *i. e.*, a point upon some branch of the third nerve, or the supraorbital at the

orbital notch ; or it may be the infra-orbital, temporal, supra-malar, inferior alveolar, or even some remote point along the course of some other nerve, that will stop the spasm.

**TREATMENT.**—This should first be directed to the cause of the irritation, and, as it is usually dependent upon corneal troubles, is relieved with them. When, however, it is independent of other affections, remedies must be prescribed for the spasm *per se*.

**Agaricus.**—*Twitchings of the lids*, with a feeling of heaviness in them, *relieved during sleep* and sometimes temporarily by washing in cold water. Spasms of the lids. It is very rare to meet a case of morbid nictitation which will not yield to this remedy. (Four-drop doses of the tincture two or three times a day will often relieve when the potencies fail.)

Other remedies which have proved useful in individual cases are Alumina, Cicuta, Ignatia, Nux v., Physos. and Pulsat. Division of the affected nerve may be necessary in aggravated cases. The use of galvanism is often of great value in some cases—the positive pole is applied on any discoverable pressure point and the negative to the back of the neck. Canthomy, the division of the structures at the outer canthus by means of scissors, may be valuable in cases of tonic spasm.

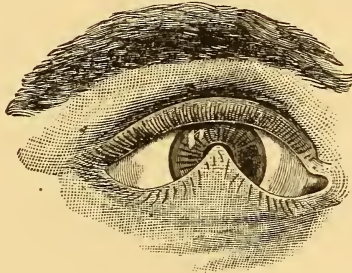
**Nictitatio.**—Constant blinking is frequently met with, especially in children and nervous, delicate persons. It is also sometimes present in exhaustion from excessive drinking, etc. This condition is generally due to some irritation in the eye itself, or may be reflex, from worms, decayed teeth, etc. Remove the cause, if determinable, and *Agaricus* will complete the cure.

**Blepharophimosis.**—Narrowing of the palpebral opening from contraction of the skin of the lid is usually caused by chronic conjunctivitis, especially when flabbiness of the skin in old age favors such a formation and is relieved by canthotomy.

**Symblepharon.**—Adhesion, partial or complete, of the eyelid to the eyeball. This condition occurs when, as the result of destruction of the mucous membrane from burns, as acids or lime, etc., or after diphtheritic or trachomatous conjunctivitis, two opposed portions of the conjunctiva grow together and may be either partial, when but one or more bands extend between the

lid and globe, or complete, when the entire surface of the lid is attached, to the globe. The lower lid is most commonly adherent, and more or less limitations in the movements of the eye ensues. It may comprise the cul-de-sacs or the border of the lids (Fig. 33). The thickness of the adherent portions may vary, and we will have a sarcomatous, membranous or fibrinous symblepharon. Owing to the restrictions in the movement of the eye, and from the possible loss of vision due to its covering the pupil, every means must be tried to prevent adhesions in burns of the conjunctiva. To accomplish this the wounded surfaces must be separated daily during healing by some mechanical means, and the applica-

FIG. 33.



Symblepharon

tion of oil or vaseline to prevent their sticking together. The mucous membrane in these cases is destroyed to such an extent that simply dividing the adhesions will do no good, as they will at once grow together again. There are two methods of operating upon these cases with some prospect of success. First by separating the affected portions and inserting conjunctival flaps brought from near by or from the opposite side of the cornea between them; or, second, failing in this, to transplant from another person.

**Ankyloblepharon** is an adhesion of the ciliary margins of the eyelids. It may be complete or partial, often combined with symblepharon, and is acquired from burns or wounds, or congenital. The *treatment* is by inserting a grooved director behind the lids and dividing the adhesions, or, when extensive, by canthoplasty with sutures in the conjunctiva to prevent readhesion.



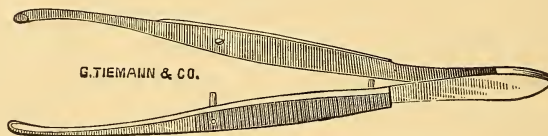
**Lagophthalmos**, is an incomplete closure of the palpebral fissure when the lids are shut together, and in the most cases there is inability to close the eyelids. It may result from a paralysis of the orbicularis, cicatrices in the skin of the lids, exophthalmos, staphyloma, etc. The danger of this condition is from ulceration of the cornea, due to its exposure to air and external irritants, owing to the inability to remove foreign substances by winking.

**TREATMENT.**—In paralytic cases galvanism, with remedies directed to the cause of the paralysis (such as syphilis, rheumatism, etc.) will often result in a cure. Cases that do not yield to this treatment require the operation of tarsorrhaphy to reduce the size of the opening of the eyelids.

**Epicanthus** is a congenital deformity in which a crescentic fold of skin projects in front of the inner canthus. It may also be seen in persons with flat noses, such as Mongolians, or syphilitics. As the child grows it disappears altogether, or becomes much less noticeable, so that operative interference is only called for in high degrees for cosmetic purposes. The operation is to remove an elliptical piece of skin from the bridge of the nose and uniting the edges of the wound together with sutures, care being taken to secure union by first intention by preventing any dragging on the stitches.

**Trichiasis and Distichiasis.**—Where there is an irregularity in the shape and position of the eye-lashes so that they become curved in and in contact with the eye, it is called *trichiasis*, and

FIG. 34.



Epilation forceps.

where there is a double row of lashes, one of which is in contact with the eye, it is called *distichiasis*. Inverted cilia may affect part or the whole of the lid, and are usually thin, pale or stunted. They cause more or less irritation of the eye, sometimes ulcers, pannus, etc., and are usually due to blepharitis, trachoma, injuries, burns, etc.

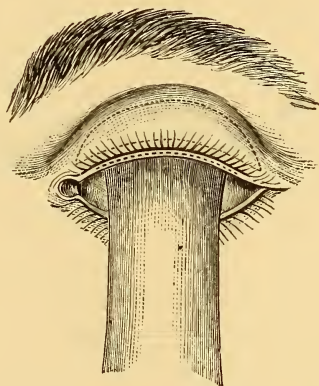


**TREATMENT.**—Where there are but a few ingrowing lashes, epilation, if often repeated, may cause an atrophy of the hair bulbs and in this way cure the case (Fig. 34).

Electrolysis, as a curative measure, is most serviceable when the lashes to be destroyed are not too numerous. This is done by inserting a needle into the hair follicle and then connecting it with the *negative* pole of the battery, the positive being applied to the temple.

Arlt's operation, when modified to meet the exigencies of the case, seems to be the most generally advisable method of operating for the severe cases and is shown in the illustration (Fig. 35). An incision two or three mm. in depth is made along the free border of the lid, splitting it into two layers.

FIG 35.



Arlt's operation for trichiasis.

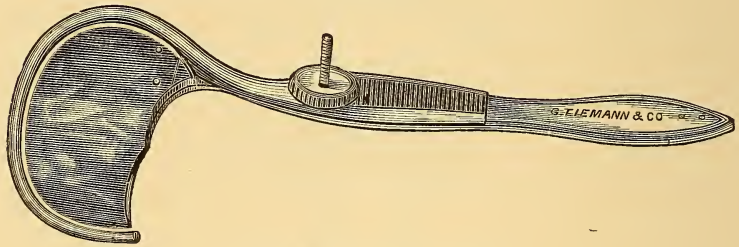
A narrow strip of skin is then excised from the lid, cutting down to the first incision, as shown in the dotted lines in Fig. 35, so that the cilia remain in a bridge of tissue, which is shifted upward and its upper edge attached by sutures to the skin of the lid—its lower margin being left free. To avoid cicatricial contraction drawing the cilia down again, some transplant a narrow strip of the skin removed from the lid into the space that gapes open in the free border of the lid.

**Entropium** is an inversion of the eyelid. We find two varieties of entropium; first the spastic, which is usually of the lower lid and is due to a spasmodic

contraction of the orbicularis muscle. It is often met with in old people, sometimes coming on after operations, and is due to the lax condition of the skin. It may also be due to irritation from a foreign body, from keratitis, etc. The second variety of entropium is the *cicatricial*, which gradually comes on during the process of cicatrization and is the result of granular and diphtheritic conjunctivitis, burns, etc., where there has been loss of substance in the conjunctiva. Entropium results in much irritation and pain in the eye. From the continuous scratching of the cornea from the inverted lashes, ulcers and pannus finally ensue.

TREATMENT.—In the spasmodic entropium a cure may often be effected by painting the parts with collodion, which should be renewed every two or three days, or oftener, in order to keep the

FIG. 36.



Knapp's entropium forceps.

lid in position. Adhesive strips may be applied for the same purpose. If these measures do not suffice, and always in the cicatricial entropium, operative interference must be resorted to before a cure can be made. Owing to the excessive vascularity of the lids, free hæmorrhage occurs from any operation upon the lids unless controlled by the use of entropium forceps (Fig. 36). There are various operations for the relief of entropium, of which perhaps Green's is the most serviceable in the majority of cases. This is made by everting the lid and making an incision from the conjunctival side, parallel to and about two mm. above its free border through the entire thickness of the tarsus, the incision to extend from one canthus to the other. A strip of skin about two mm. above the cilia is then removed. Three sutures are then passed from the conjunctival side of the cilia through the free edge of the tarsus to just above the lower border of the skin

wound; from there they pass through the muscular fibres on the outer surface of the tarsus and emerge from the skin about half an inch above the upper border of the wound. On tying these sutures the ciliary border is everted and the skin wound closed.

Streatfeild's operation is the removal of a strip of skin with subjacent muscular fibres and a portion of the tarsus, just above the border of the lid, by cutting a deep V-shaped groove in its outer surface.

Other operations are Arlt's, already described, and those of Hotz, Snellen, Pope and others.

Remedies may possibly be useful, if the inversion is recent and only slight in degree. The following are suggested: Aconite, Argent. nit., Calc. and Natrum mur.

**Ectropium** is an eversion of the eyelids. The eversion may be slight or so great as to expose almost the whole of the palpebral conjunctiva. Ectropium is also divided into two classes, the *spastic*, due to chronic inflammation and swelling of the conjunctiva, which separates the lid margin from the eye, and this separation serves to increase the trouble by causing the tears to flow over the lid, which, in its turn by this irritation, aggravates the existing trouble. This form is also sometimes seen in children—due to the swelling and inflammation of the conjunctiva, with contraction of the orbicularis. There is also in some cases a drooping of the lower lid from paralysis of the orbicularis, or from a defective innervation of this muscle in old people, which allows the tears to flow over the lid and cause ectropium. The *cicatricial* ectropium is due to a contraction after loss of the skin of the lids or of the face, following burns, wounds, abscesses, caries of the edge of the orbit with adhesions of the skin, etc.

**TREATMENT.**—In cases of spastic ectropium we may sometimes give relief by replacing the lid and retaining it there for several days by the use of the compress bandage. Scarification or removal of a strip of the conjunctiva to reduce the obstruction from thickening of the conjunctiva, together with the slitting up of the canaliculus, to permit the passage of the tears through the normal channels, may be tried. Other operations recommended to correct this affection are legion, and, as they must necessarily vary in nearly every case, according to the cause, degree and position of the eversion, but two will be detailed.

No plastic operation should be attempted until all tendency to contraction of the cicatrices has disappeared. In all flap operations allowance must be made for shrinking.

In Wharton Jones's operation a V-shaped (Fig. 37) incision is made to include all the cicatricial tissue possible; the flap thus formed is to be dissected from the underlying tissues, and the skin at either side undermined sufficiently to allow of the lid

FIG. 37.

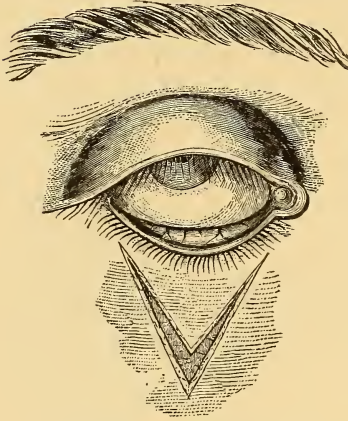
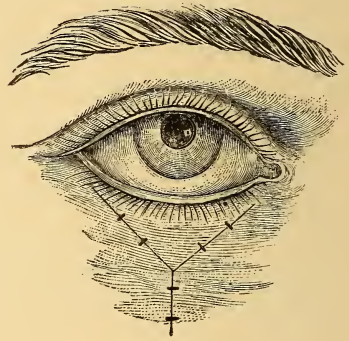


FIG. 38.



Wharton Jones's operation.

Wharton Jones's operation (completed).

being returned to its normal position. The exposed surface is then to be covered by bringing together the edges of the V-shaped wound with sutures so that it becomes Y-shaped (Fig. 38.)

Dieffenbach's operation is especially useful in the cicatricial form of ectropium and is made by dissecting away the diseased tissue by a triangular incision. A flap of skin is then loosened by careful dissection from the immediate neighborhood and shifted up on the exposed surface, where it is kept in position by pins and sutures. (See Figs. 39 and 40.) The surface from which the flap was removed, if small, will become covered by growth of the integument from the edges of the wound; but, when large, it should be filled with grafts of skin from other parts of the body. The ectropium may also be corrected by skin grafting from other parts.

**Apis.**—Is especially indicated in the first stage of this affection, in which the swelling of the conjunctiva is very great.

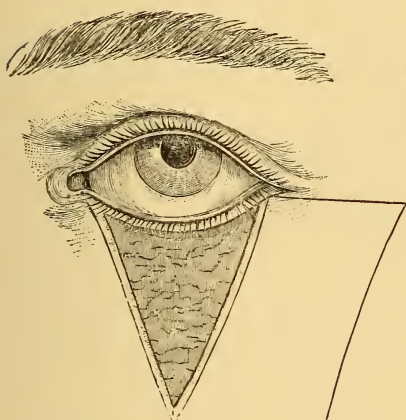


**Argent. nit.**—If the lids are swollen, inflamed, everted and the *puncta lachrymalis* very red and prominent. The discharge of tears and pus is profuse.

**Hamamelis vir.**—A dilute solution of "Pond's Extract" applied locally is said to have cured a case occurring during the course of a severe conjunctivitis.

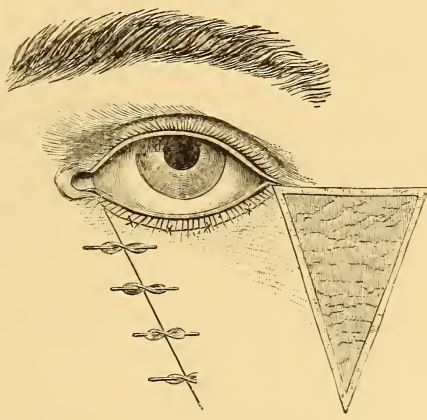
Little reliance must be placed upon internal medication in either entropium or ectropium, as operative measures are almost invariably necessary, except occasionally in the first stage.

FIG. 39.



Dieffenbach's operation.

FIG. 40.



Dieffenbach's operation (completed).

**Molluscum Contagiosum** is an affection of the sebaceous glands. It consists of small, round, umbilicated whitish prominences which may become inflamed and go on to suppuration. It is a hypertrophy of the gland and the tumor is composed of epithelial elements. The contents can often be pressed out through the depression at the summit of the tumor. For treatment see *chalazion*.

**Xanthelasma** is a hypertrophy of the sebaceous glands and a fatty degeneration of the connective tissue of the skin. They appear as yellowish patches, especially on the upper lid. Ivins\* reports a case cured in fifteen treatments by the galvanic current

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\*The Hahnemannian Monthly, December, 1897.



of five milliamperes applied for fifteen minutes at each sitting. He used a special pliable silver electrode, two rods,  $\frac{3}{8}$  of an inch in diameter, so adjusted as to be easily approached to contact or separated to two inches. These two electrode points, wet in salt water, were so separated as to bring one at each end of the patch, on the normal skin. They may be removed when small by excision, for cosmetic purposes. Excision of large patches in some cases might result in ectropium.

**Milium** are small, circular, white tumors. They are removed by incision and pressing out of the contents.

**Papillomata** (*warts*) are occasionally found upon the edge of the eyelid and upon the conjunctiva. They should be snipped off.

**Dermoid cyst** is congenital, and contains hair-follicles, hairs, connective tissue, fat, etc. It is generally situated at the outer angle of the orbit, develops slowly and causes but little inconvenience. It should be removed without rupturing the tumor, if possible.

**Nævi** are found on the eyelids and are similar in appearance to those occurring elsewhere. They are best removed by the galvano-puncture.

**Chalazion** (*Meibomian or Tarsal Cyst*).—Latest authorities seem to consider a chalazion as a granuloma in connection with a Meibomian gland, and not a mere retention cyst. There is, however, at the same time associated with it an inflammation of the tissues surrounding the gland. It varies in size, rarely growing larger than a good-sized pea; several may occur at the same time or they may recur in successive crops. It is hard and tense to the touch, and the skin is freely movable over it, but the tumor is adherent to the underlying tissues (Fig. 41).

It develops slowly, causing no inconvenience for months. It may suppurate, and, when it does, it usually points on the conjunctiva.

**TREATMENT.**—*Excision*, as a rule, is the most satisfactory treatment of tarsal tumors, providing there are only one or two. But as it is usually tedious and painful to remove entire a small solid tumor, we may substitute for excision, opening of the tumor,

squeezing out its contents, and stirring up the sac with the point of a knife. The opening of a chalazion should always be through the conjunctiva if possible. It may have to be repeated several times, but as there will be little pain attending the operation, no objection will be made by the patient. After opening, I usually give Hepar low to promote absorption of the sac. In the case of cystic tumors the whole of the cyst wall should be removed; it may be destroyed by the use of a seton, but removal with the

FIG. 41.



Large chalazion of the upper lid.

knife is usually more satisfactory. Many cases have been cured by internal medication alone, and remedies should always be employed, whether the knife is used or not, for they no doubt hasten the cure and serve to prevent recurrence.

**Staphisagria.**—An important remedy for tumors of the lid. It is my custom to apply the tincture externally at the same time the remedy is being taken in potency. Enlargement of the glands of the lids, which are red and accompanied by tensive tearing pains, especially in the evening. For little *induration of the lids, resulting from styes*, or for successive crops of small tarsal tumors, this drug is especially indicated.

**Thuja.**—This is one of the most valuable remedies for tarsal tumors, whether single or multiple, especially if they appear like a condyloma, either of the internal or external surface of the lid. We have seen them disappear by simply giving the drug internally, though it usually seems to act more speedily if we use, at the same time, the tincture externally. It is also recommended for the prevention of their return after removal by the knife.

For condylomata, or warty excrescences on the lids, especially if occurring in syphilitic subjects, this drug deserves attention.

**Hepar.**—Tarsal tumors that have become inflamed and are sensitive to touch. It also aids absorption after operation.

**Calcarea carb.**—Tarsal tumors occurring in fat, flabby subjects.

**Causticum.**—Tumors; especially warts, found on the lids and eyebrows.

**Conium.**—Induration of the lids remaining after inflammation.

**Pulsatilla.**—Tarsal tumors of recent origin that are subject to inflammation, or are accompanied by catarrhal conditions of the eye. The temperament and general symptoms will decide the case.

**Zincum.**—Tumors of the lids with *soreness and itching in the internal canthi*.

Baryta carb. and iod., Graph., Lyco., Kali iod., Merc., Nitric acid, Sep., Sil. and Sulph. may be required.

**Epithelioma** is the most frequent malignant growth affecting the eyelid. It rarely occurs before the age of forty, and appears first as small hard nodules, and later becomes covered with a scab, which, on being removed, shows a slight excoriation; this increases to an ulceration of considerable depth, with purulent secretion and irregular, hardened edges. It may remain indolent for months, then assume an active stage, leading rapidly to extensive destruction of tissue. In the early stages there is little or no pain, but becomes excessively painful in the later stages.

Epithelioma, lupus and chancre have a very similar general appearance

#### DIFFERENTIAL DIAGNOSIS.

Epithelioma.	Lupus.	Chancre.
Indurated irregular edges. Slow growth. Attacks middle-aged and elderly people. Lymph glands of neck involved late.	Less induration. More inflamed. Growth slower than epithelioma. Lymph glands involved late. Generally associated with lupus elsewhere in body.	Indurated, but edges more rounded. Rapid growth. Usually in younger subjects. Lymph glands early involved. Other symptoms of syphilis.

**Lupus and Sarcoma** have both been found affecting the eyelids. A lupoid growth is more slow in development than an epithelioma, and both may result in ulceration ; but, as Noyes<sup>1</sup> so well says, " A discrimination between them is hardly needful for practical purposes."

**TREATMENT.**—*Excision* is advised in all malignant growths of the lids, if the disease is circumscribed and moderate in extent ; care being taken that all the morbid tissue is removed. The edges of the wound may be brought together by sutures, or a plastic operation may be made, bringing the integument from the temple or some adjoining point.

Juler<sup>2</sup> advises *scraping* away all the diseased tissue by means of a small steel scoop. This is attended with considerable hæmorrhage, and is tedious, but he claims its success in arresting this malignant affection is marvellous.

Various caustics have been employed, chief among which may be mentioned caustic potash, nitrate of silver, chloride of zinc, arsenic paste and acetic acid. An objection to the use of caustics lies in the deformity apt to occur afterward. Electrolysis has been recommended.

If the disease is very extensive, involving the tissues of the face to such an extent that extirpation is impracticable, we then rely chiefly upon our internal remedies, using only such local applications as prove agreeable and of temporary relief to the patient. For instance, if the discharge is profuse and offensive, a weak solution of carbolic acid, salicylic acid, or some other disinfectant proves of service. An application from which we have often seen excellent results is carbolic acid and linseed oil (4 grains to the ounce) ; it relieves the patient and seems to exert a beneficial effect over the progress of the disease.

**Iodoform.**—Dr. George A. Shepard reports surprising results in two cases of lupus from the administration of this drug in the third decimal trituration.

**Apis**—Lupus non-exedens, *sharp, stinging pains*, and tendency toward puffiness of the lower lids.

**Hydrocotyle asiatica.**—Has obtained a high reputation in the hands of Dr. Boileau as a remedy for lupus and deserves our attention.

<sup>1</sup> Diseases of the Eye, 1890.

<sup>2</sup> Ophthalmic Science and Practice, 1884.



**Phytolacca dec.**—Benefit seems to have been derived in relieving, if not curing, malignant ulcers of the lids, when used both externally and internally.

**Thuja.**—Epithelioma of the lids.

**Syphilitic Ulcers, Chancre, and Gummata** are all occasionally found on the eyelids, and should be treated the same as occurring elsewhere. The most useful remedies are the following, prescribed according to general indications: *Ars.*, *Apis*, *Aurum*, *Cannab.*, *Hepar*, *Kali. iod.*, *Merc.*, *Nitric ac.*, and *Thuja*.

**Herpes Zoster Ophthalmicus** commences with severe neuralgic pains along the supraorbital division of the fifth nerve of one side, sometimes the nasal and rarely the infra-orbital branch of the same nerve. The skin becomes swollen and red, covered with herpetic vesicles which unite, crusts form upon them, followed by ulcerations which ultimately leave deep cicatrices. The cause of the disease is probably an inflammation of the nerve and the Gasserian ganglion belonging to it. The disease involves one-half of the face, never extending beyond the median line, and has often associated with it corneal ulcers and iritis. The intense pain that precedes the herpetic eruption may last for a few hours, or extend over months, but usually subsides with the appearance of the vesicles.

**TREATMENT.**—The remedies most useful are: *Ars.*, *Croton tig.*, Electricity, *Canth.*, *Graph.*, *Merc.*, *Puls.*, *Ranunc. bulb.* and *Rhus*.

**Contusions** are very often found, and are frequently accompanied by some lesion of the globe or orbit.

**TREATMENT.**—Immediately after contused wounds of the lids, cold compresses should be employed; they should be applied with a firm bandage, which often proves of advantage in limiting the amount of ecchymosis.

*Arnica*, our great remedy for all contusions, deserves its extensive reputation for curing "black eyes," as there is no other drug better adapted to this condition. A solution of the tincture in water, ten drops to the ounce, is usually employed, though both stronger and weaker solutions are in vogue. *Ledum*, used in the same manner, has also proved of service.



**Wounds.**—We may have an incised, lacerated, or penetrating wound of the lid; and, in all cases, the condition of the orbit and globe should be carefully examined to see if they remain intact.

**TREATMENT.**—The first object in view should be to bring together the edges of the wound by means of sutures, adhesive strips or collodion. If the wound is incised, without any contusion, and the edges are early brought accurately together, a dry dressing will often be found most beneficial.

Hamamelis and Ledum have both been recommended for wounds of the lids.

**Burns and Scalds** must be treated as usual in other parts of the body, except that care should be taken to prevent the union of the lids (ankyblepharon) by frequently opening them, and by inunction of the edges with simple-cerate or cosmoline; also, great attention should be paid to the prevention of a cicatrix (which causes ectropium) by keeping the skin on the stretch by a bandage during the period of cicatrization. Cosmoline is especially recommended as an external application.

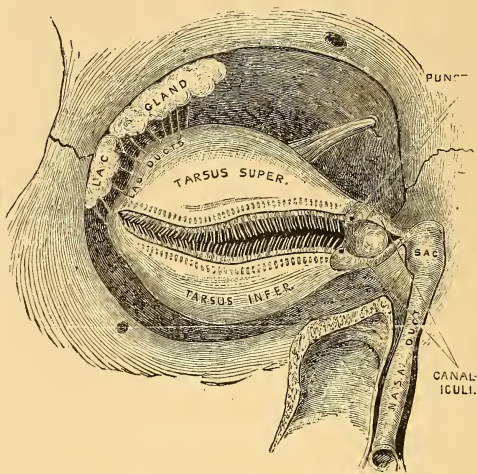
When dependent upon the stings of insects, the sting should be removed and cold water dressings applied.

## CHAPTER VIII.

## Affections of the Lachrymal Apparatus.

**Anatomy.**—The *lachrymal gland* is lodged in a fossa at the outer and upper part of the orbit and close to its anterior margin. It is separated into two portions by a septum of connective tissue, the larger part of the gland being about twenty mm. in length and ten to twelve in breadth. It is a compound tubulo-racemose gland like the serous salivary. The excretory ducts, some ten to fourteen in number, run from both portions of the gland to the

FIG. 42.



Dissection of lachrymal apparatus.

upper and outer part of the superior fornix of the conjunctiva. The secretion of the lachrymal gland is faintly alkaline, containing about 1.25 per cent. of sodium chloride and .5 per cent. of albumin. It serves to moisten the anterior surface of the eye, and passes off through the puncta, canaliculi, lachrymal sac, and nasal

duct, into the inferior meatus of the nose (Fig. 42). The *puncta* are the two minute openings of the canaliculi, on the free margin and about six mm. from the inner angle of the lids. The *canaliculi*, both upper and lower, extend from the puncta to the lachrymal sac, just before reaching which they unite. The upper canaliculus is slightly smaller than the lower, and first ascends, then turns downward and inward. The lower canaliculus first descends, then runs horizontally to the sac. The *lachrymal sac* is the upper dilated portion of the nasal duct. It is located in a groove formed by the lachrymal and superior maxillary bones; its upper end is closed and rounded. The *nasal duct* extends from the lachrymal sac to the inferior meatus of the nose. The bony canal is lined with a fibrous membrane, and this, in turn, by cylindric epithelium like that of the nostrils. It is highly vascular and thrown into folds at two or three points. The total length of the sac and duct is about one inch. Its direction is downward, backward and slightly inward. The tears are forced into the excretory passages by muscular action, aided by a kind of suction caused by the muscular fibres of the puncta and canaliculi.

**Dacryoadenitis.**—Inflammation and abscess of the lachrymal glands are extremely rare. In the *acute* form the symptoms are, great swelling and redness of the upper lid at its outer angle. The globe may be displaced downward and inward by the swelling. The pain is severe and increased by touch. The conjunctiva is inflamed and may be chemosed. The inflammation may terminate by resolution, suppuration, or run into the *chronic* form, in which all the acute symptoms are less severe, merely a considerable swelling remaining. Dacryoadenitis is generally caused by injury, and this fact, together with its symptoms, makes it very difficult to diagnose from periostitis of the orbit or abscess of the lid.

**TREATMENT.**—When in the early stage, before there is a formation of pus, ice will often cut short an attack which might otherwise go on to suppuration. As soon, however, as there is evidence of suppuration, we should resort to hot fomentations in order to promote suppuration, and, when well established, a free incision should be made through the conjunctiva, if possible.

The most useful remedies are Acon., Apis, *Hepar*, Rhus and Silicea. For indications see *dacryocystitis phlegmonosa*, page 139.

**Hypertrophy of the Lachrymal Gland** is very rare. It is a circumscribed, nodular tumor of gradual growth and has been known to occur in children and infants. If it increases sufficiently to cause interference with the movements of the eyeball it should be removed.

**Tumors of the Lachrymal Gland**, such as fibroids, sarcomas, adenomas, hydatid cysts and cancers have all been recorded. They require extirpation of the gland.

**Anomalies of the Puncta and Canaliculi.**—Eversion of the puncta is frequently found in blepharitis and conjunctivitis, causing epiphora, or watering of the eye, and will often result in ectropium from the irritation of the tears flowing over the lid.

The same result will occur from a narrowing or stoppage of the canaliculus, from wounds of the lid involving the canaliculus, or foreign bodies in the canaliculi blocking the passage of the tears. Obstruction of the canaliculus can be relieved by slitting up the canal with the canaliculus knife (Fig. 43), a narrow-bladed, probe-pointed knife, which is to be entered into

FIG. 43.



Agnew's canalicula knife.

the puncta vertically, the handle then brought to a horizontal position, when the knife is pushed directly inward until it reaches the inner wall (the lid being kept taut with the thumb of the other hand), the knife is then brought to the vertical position, cutting through the whole length of the canaliculus. The edge of the knife should be kept toward the conjunctiva during its passage, so as to divide the canaliculus close to the muco-cutaneous junction. It is better, where possible, to preserve the physiological suction action of the canaliculus by only slitting it up for two or three mm. from the punctum and dilating the remainder of the canal with probes.



**Stricture Ductus Lachrymalis.**—Stricture of the nasal duct is the most common affection of the lachrymal apparatus.

**SYMPTOMS.**—The chief characteristic symptom of stricture is the overflow of tears, which is increased on exposure to cold wind or bright light. There is also often noticed a dryness of the nostril on the same side as the stricture. Usually on making pressure with the finger over the sac we can press out from the puncta a few drops of clear viscid secretion. We may also find a slight conjunctivitis present.

**CAUSES.**—It is usually due to the extension of a nasal catarrh. Injury or periostitis of the nasal bones, carious teeth, or pressure from tumors in that vicinity may cause it. Its treatment will be found under *dacryocystitis*.

**Dacryocystitis Catarrhalis.**—Catarrhal inflammation of the lachrymal sac is generally the result of a stricture or associated with it. The catarrhal inflammation, on the other hand, may be the cause of the stricture, as the swelling of the mucous membrane will in itself cause a damming up of the secretions. The retention of the tears, from obstruction, causes a gradual distension of the sac—a swelling at the inner angle of the eye. By making firm pressure on this swelling the mucus can be pressed either out of the canaliculus, or if no stricture remaining, down through the nasal duct into the nose. The contents of the swelling may be either clear and transparent or mixed with pus. This disease usually develops very slowly, with simply the history of having had a watery eye for a long while previous to noticing any swelling of the sac, and oftentimes they will notice a dryness of the corresponding nostril. The swelling is usually free from pain or sensitiveness to touch.

**TREATMENT.**—Since lachrymal diseases are frequently dependent upon nasal catarrh, treatment must be directed to this affection.

As in nearly all cases of blennorrhœa of the sac, a more or less firm stricture of the lachrymal duct is present, this will require our special attention. If the stricture is due to inflammatory swelling of the mucous membrane, the knife is rarely necessary. Bony strictures are to be regarded as incurable. The cutting of the stricture is only necessary in those rare cases that will not yield to probing and electrolysis.



If the stricture in the nasal duct is so firm as to not yield to the probe, the best operation to divide the stricture is that of Stillings, who, after slitting the canaliculus (as already described), introduces into the lachrymal sac a triangular shaped knife (Fig. 44) in the same way as a probe, and then forces it down two or three times in succession, the blade being turned in a different direction at each passage.

FIG. 44.

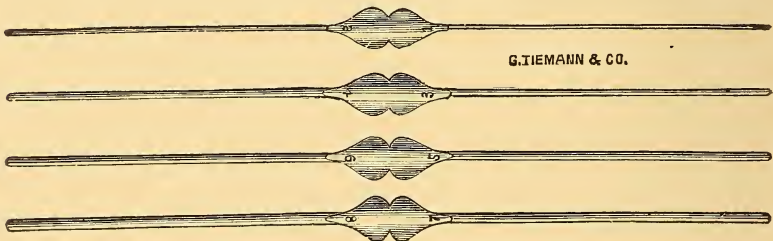


Norton's modification of Stillings's knife for stricture of the lachrymal passage.

Blood issuing from the nostrils is proof that the passage has been opened. Care should be taken for a day or two after the operation to see that the canaliculus does not close, and, commencing on the second day after the operation, the duct should be probed every two or three days until it remains permanently opened.

A passage sufficient to admit of a Bowman probe, from No. 5 to 8 (varying in different cases), should be secured (Fig. 45). The use of larger probes has been recommended, but in my experience they have not proved as satisfactory. If there is very little catarrhal inflammation, especially in children, it is not always necessary to probe after Stillings's operation. A far better method than operating, when it can be carried out, is that of gradual dilatation of the strictures by using larger and larger

FIG. 45.



Bowman's set of probes, Nos. 1, 2, 3, 4, 5, 6, 7, 8.

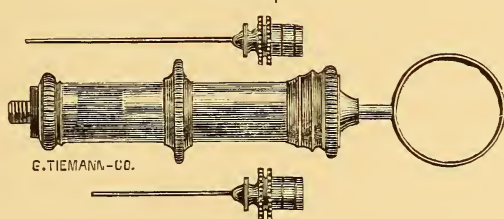
probes. Commencing with No. 0 or 00, the canaliculus and duct can be gradually distended so as to admit of a No. 4 or 5 Bowman

probe without even slitting the canaliculus. In many cases the dilatation to simply a No. 1 probe has been sufficient to result in a cure, and in some cases it seems to be better than to dilate to a larger size. Rarely, where the punctum is occluded, it will be necessary to slightly nick it with the point of the knife so as to admit of the smallest-sized probe. The advantages of this method seems to lay in the fact that we do not destroy the function of the parts and that the normal suction action of the canal is retained. This plan, of course, is not practical in very firm or bony strictures. Marked benefit has also been observed from electrolysis, and there is no doubt it should be more extensively employed. My plan has been to insert a probe the usual way until it comes in contact with the stricture, then attaching the probe to the *negative* pole of a battery, apply the positive to the temple, and make gentle pressure as the stricture yields. Usually four or five treatments will be sufficient to keep the passage permanently opened.

In the treatment of the blenorrhœa, a free vent for the secretions through the opened or unopened canaliculus being present, *the patient should be instructed to press out the matter several times a day.*

Mild astringent injections of boracic acid, sulphate of zinc of a two to four per cent. solution or some similar preparation may sometimes prove very serviceable.

FIG 46.



Agnew's lachrymal syringe.

Recently I have been using with good results an injection of the blue pyoktanin, 1 to 1,000.

**Pulsatilla.**—One of the most important remedies for dacryocystitis, which may sometimes be cut short at its very beginning with it, and may be useful at any stage of the inflammation. It

is also important in blennorrhœa of the sac, if the *discharge is profuse and bland*. Profuse thick and bland discharge from the nose; especially beneficial in children.

**Stannum.**—Very favorable results have frequently been obtained in controlling the yellow-white discharge from the lachrymal sac, itching or sharp pain in the inner canthus, especially at night.

**Hepar sulph.**—Inflammation of the lachrymal sac after pus has formed, or in blennorrhœa, *with great sensitiveness to touch and cold*, with profuse discharge. Throbbing pains.

**Euphrasia.**—Much *thick, yellow, acrid discharge*, making the lids sore and excoriated. Blurring of the vision relieved by winking. Thin, watery, *bland* discharge from the nose.

**Argentum nit.**—Discharge very profuse, caruncula lachrymalis swollen, looking like a lump of red flesh; conjunctiva usually congested.

**Aconite.**—In the first stage, when the lids are much swollen, with great heat, dryness, tenderness, sharp pains and general fever.

**Apis.**—Before the formation of pus. Lids œdematously swollen, with stinging, shooting pains. Patient drowsy, without thirst.

**Arum triph.**—Catarrh of the lachrymal sac, with desire to bore into that side of the nose; nose obstructed, compelling to breathe through the mouth; nostrils sore, the left discharges continually.

**Mercurius.**—In the later stages after the pus has become thin and excoriating; acrid coryza; nocturnal aggravation.

**Petroleum.**—Discharge from the lachrymal sac, with roughness of the cheek, occipital headache, and other marked concomitant symptoms. In the early stages, when there is considerable swelling of the lids, with burning pains.

**Silicea.**—Occasionally indicated in dacryocystitis characterized by the usual symptoms of pain, swelling, tenderness and lachrymation; even cases that have far advanced toward suppuration have been checked. Blennorrhœa of the lachrymal sac often calls for it. The patient is particularly sensitive to cold air and wishes to keep warmly covered.

Other remedies which have been recommended and proved use-

ful are Bell., Calc., *Cinnab.*, Hydrast., Kali iod., Merc. prot., *Nat. mur.*, Nux, Sulph. and *Zinc sulbh.*

**Dacryocystitis Phlegmonosa.**—Phlegmonous inflammation of the lachrymal sac may be considered as merely a higher stage or extension of the preceding disease. It consists in a purulent inflammation of the connective tissue surrounding the lachrymal sac, and results in an abscess that breaks externally.

**SYMPTOMS.**—In this the swelling is greatly increased and extremely sensitive to touch. The integument becomes very tense and assumes a dusky-red hue. There is usually an œdematous infiltration of the surrounding parts, viz.: eyelids, side of the nose and cheek. There is intense pain and heat, with sometimes general symptoms of chills, fever and vomiting. The conjunctiva may be inflamed and even chemosed.

**Differential Diagnosis.** The appearance at this time resembles an abscess of the cellular tissue overlying the lachrymal sac and must be carefully differentiated, but in the dacryocystitis phlegmonosa firm pressure over the swelling will usually empty the tumor either through the puncta or downward through the nose, while in abscess it will not. In dacryocystitis we also have the previous history of a long-continued lachrymation, which is, of course, absent in abscess. An abscess over the lachrymal sac is rare, and we may therefore generally assume the abscess to have originated within the sac.

**COURSE.**—If left to itself the swelling usually increases steadily, the skin over the sac becomes thinner and thinner, until it finally gives way, the abscess discharges leaving a fistula of the lachrymal sac, which is extremely difficult to heal.

**CAUSE.**—A catarrhal inflammation precedes a phlegmon. The decomposed secretions in the sac penetrate the mucous membrane and set up a purulent inflammation. The exciting cause is frequently a simple cold in the head.

**TREATMENT.**—At the commencement, before the formation of pus, cold compresses (even ice) are advisable, which, together with the indicated remedy, may cause the inflammation to abort before an abscess has formed.

As soon, however, as pus has begun to collect in the lachrymal sac, our treatment must undergo a decided change. The *first* and



most important step to be taken to prevent its breaking externally, with the possible formation of a fistula, is the opening of the canaliculus into the sac and the evacuation of its contents, through the natural channel. But if the disease has so far advanced that perforation is inevitable, a free incision into the sac should be made externally, after which, and also in case the abscess has opened spontaneously, warm compresses may be employed for twenty-four or forty-eight hours, but must not be continued too long. The opening should be kept open by the insertion of a strip of iodoform gauze every day until the subsidence of the inflammation, when the opening will usually close without trouble, though it may be necessary to open the nasal duct and establish a free passage for the tears before it does so. Probing of the nasal duct should be avoided until the severity of the inflammation has subsided. Warm and moist applications should be substituted for the cold as soon as suppuration has commenced. Among the best of those in use is a solution of calendula. Internal medication during the whole course of the disease will form an important feature in the treatment. For indications see *dacryocystitis catarrhalis*, page 137.

**Fistula Lachrymalis.**—An opening externally of the lachrymal sac, when the result of an abscess breaking, is often very obstinate and difficult to heal; hence, when evidently about to break, it should be opened with a bistoury.

**TREATMENT.**—The first point to be attended to is to see that the passage is free into the nose. We must therefore slit up the canaliculus and divide any stricture found in the nasal duct, providing it is sufficient to interfere with the flow of tears; after which the canal should be kept open.

The fistula must now be healed, and, if recent, this is best done by touching the edges with a stick of nitrate of silver, or the gentle application of the galvano-cautery. If the edges of the fistula are healed and covered with smooth skin, it will be necessary to pare the edges and unite with a suture.

The following remedies have been advised and may have been of service in recent cases, though we doubt if any effect can be obtained in old chronic fistulæ: Brom., Calc., Fluoric ac., Lach., Merc., Nat. mur., Petrol., Sil. and Sulph.



## CHAPTER IX.

## Diseases of the Orbit.

**Anatomy.**—The shape of the orbit is that of a quadrangular pyramid, the base or facial opening, the four walls and the apex. The axes of the orbits converge posteriorly at an angle varying in different individuals. The bones entering into the formation of the orbital walls are the frontal, sphenoid, superior maxillary, malar, palate, ethmoid and lachrymal. The optic foramen, situated at the apex of the orbit, transmits the optic nerve and the ophthalmic artery. The superior orbital fissure transmits the third, fourth and sixth nerves, ophthalmic branch of the trigeminus, the superior and inferior ophthalmic veins, few sympathetic filaments from the cavernous plexus, the recurrent lachrymal artery and sometimes orbital branches of the middle meningeal artery. The inferior orbital fissure gives passage to the malar and infra-orbital nerves, infra-orbital vessels, a facial branch of the ophthalmic vein, and the ascending branches of the sphenopalatine ganglion. The supra-orbital notch, at the upper and inner margin of the orbit, contains the supra-orbital nerve, artery and vein as they pass to the forehead. The orbit, in addition to the eyeball, vessels, muscles, etc., contains considerable adipose tissue.

*Tenon's Capsule* is the limiting membrane between the cellulofatty tissue and the globe and conjunctiva. It ensheaths to some extent the muscles, vessels, nerves, etc., that pass through it, and is continuous with the periosteum of the orbit as well as with the conjunctiva. It is somewhat analogous to the pleura, and serves as a cup in which the globe revolves. It constitutes a secondary attachment for the ocular muscles, and by this attachment it renders it possible to sever the tendon of a muscle without losing its entire action upon the eye, for it still remains in connection with the eye through Tenon's capsule, unless too extensive lateral cuts have been made, separating the tendon from the capsule.

The dura mater is firmly attached at the sphenoidal fissure and

optic foramen and is continuous with the outer sheath of the optic nerve and with the periosteum of the orbit.

**Cellulitis Orbitæ** (*Abscess or Phlegmon of the Orbit*).—Inflammation of the cellular tissue of the orbit may occur as a simple *œdematous cellulitis* or in a far more active form as a *phlegmonous cellulitis*.

**SYMPTOMS.**—In *œdematous cellulitis* the eye will be slightly bulged forward, its movements limited and sometimes diplopia is complained of. There is usually in these mild cases little or no swelling or redness of the lids or conjunctiva, and but little dull pain, except on pressure upon the globe. This form of cellulitis generally occurs in young and delicate children, and usually subsides within a few days.

In the severer form, or *phlegmonous cellulitis*, the onset is apt to be accompanied with a chill and rise in temperature. There will be swelling and dusky discoloration of the lids, especially the upper, and a more or less intense pain, greatly increased by pressure upon the globe. The eyeball is protruded directly forward, and its movements limited in all directions; in some severe cases it will have absolutely no motion. (In periostitis, which it closely resembles, there is greater swelling and redness and the protrusion of the eye and the limitation in its movement is in but one direction.) The conjunctiva is chemosed and the cornea completely or partially anæsthetic. Diplopia is usually present and the vision may be greatly impaired from optic neuritis and atrophy. Digital examination will find the tissues firm, tense and very painful to the touch. In extreme cases the eyeball may become involved and end in panophthalmitis.

**CAUSES.**—Various and frequently obscure. May be metastatic from phlebitis, septicæmia, puerperal fever, etc. It is often coincident with facial erysipelas. May result from cold, from injuries, periostitis and inflammation of the lachrymal gland.

**PROGNOSIS.**—Is always serious as vision may be lost from neuritis, slough of the cornea, or panophthalmitis. It may terminate fatally through meningitis and abscess of the brain, though the large majority recover.

**TREATMENT.**—When due to a foreign body, it should be removed, and the ice bag employed to subdue if possible the inflam-

matory symptoms. But if suppuration has already set in, poultices should be applied to promote the discharge of pus, which should be evacuated *at an early period*, by a *free* incision through the conjunctiva if practicable, if not, through the lid itself. Care should be taken that the pus has free vent at all times. Noyes (*loc. cit.*) advises an early incision, even before pus forms, claiming its value "as a means of arresting the phlegmonous inflammation and the formation of pus," as by the incision "the oculo-orbital fascia is relieved, the vessels are unloaded, serum finds vent and the tissues are relaxed." Diet and rest should be prescribed according to the general tone of the patient and severity of the attack.

**Rhus tox.**—This is a remedy of the very first importance in this form of inflammation. *The lids are œdematously swollen, as well as the conjunctiva*, and, upon opening them, a profuse gush of tears takes place. The pains are especially severe at night, vary in character and may be greatly influenced by any change in the weather. Panophthalmitis is liable to complicate the trouble.

**Hepar sulph.**—Especially after pus has formed. Lids swollen and *very sensitive to both touch and cold*. The pains are usually of a *throbbing character*.

**Phytolacca.**—Inflammation of the cellular tissue of the orbit without much pain, slow in its course and with little tendency to suppuration. The eye will be protruded and the infiltration into the orbit and lids will be hard and *unyielding to touch*.

**Aconite.**—In the first stage, when the lids are much swollen, with a tight feeling in them; chemosis, with much *heat* and *sensitiveness* in and around the eye, and a sensation as if the eyeball were protruding, making the lids tense, associated with the general Aconite fever.

**Apis mel.**—Before the formation of pus. *Lids œdematously swollen, with stinging, shooting pains*. Patient drowsy, without thirst.

**Lachesis.**—Orbital cellulitis following squint operation, point of tenotomy sloughing, with a *black spot in the centre*; chemosis, and much discharge, with general Lachesis condition.

**Mercurius.**—In the later stages after pus has formed, and even after it has discharged for some time and has become *thin* in

character, especially if occurring in a syphilitic subject. There is often much pain in and around the eye, always worse at night.

Other remedies may be thought of, as Ars., Bell., Bry., Kali iod., Sil., Sulphur.

**Tenonitis.**—Inflammation of the capsule of Tenon is a comparatively rare disease which may follow operations for strabismus and less frequently occurs idiopathically, especially in those of a rheumatic diathesis.

**SYMPTOMS.**—There may be slight swelling of the lids, chemosis of the conjunctiva, exophthalmos and diminished mobility of the eye. Pain more or less severe, especially on pressure or movement of the eye, is apt to be present.

**TREATMENT.**—Internal medication is all sufficient in this disease and the most serviceable remedies are *Kalmia lat.*, Kali iod., Rhus and Puls.

**Periostitis Orbitæ.**—Inflammation of the orbital periosteum may result from injuries or occur idiopathically in rheumatic, syphilitic or scrofulous subjects. The disease is most commonly found in early life and its usual location is the margin of the orbit.

**SYMPTOMS.**—There is present pain, especially from pressure on the bone, œdema of the lids, chemosis and a tense, swollen, sensitive spot in which fluctuation may be detected later. In the acute form there may also be fever, vomiting, delirium, etc. Periostitis in its *acute* form resembles very closely a phlegmonous cellulitis, and must be differentiated by the acute pain on pressure upon the orbital margin; by less swelling and redness of the lids; the inflammation is more circumscribed, so that the displacement of the eyeball is in one direction and its mobility is more restricted in one direction.

In the *chronic* form of periostitis there is simply slight swelling of the upper lid and supra-orbital pain, together with localized swelling at the seat of the inflammation. This is the more frequent form, and especially found in young scrofulous subjects.

**COURSE.**—When chronic, it is very tedious, lasting months or years, and is apt to result in caries of the bone, fistulæ, deformity of the lids, etc. In the acute form, if the abscess is near the surface and promptly opened, it may heal in a short time; but if deep



and neglected, or if occurring in one of a syphilitic or scrofulous constitution, will usually be much more serious.

**PROGNOSIS.**—When near the orbital margin it is favorable, but if deep in the orbit it is much less so, as it may result in atrophy of the optic nerve, paralysis of the orbital muscles, or meningitis.

**TREATMENT.**—See *Caries*.

**Caries and Necrosis** of the orbital walls is almost universally a result of periostitis or an injury, although it may occur in the bone itself without a previous inflammation of the periosteum, especially in syphilitic or scrofulous subjects. After the abscess has opened, a fistula is formed which leads to the roughened and denuded bone. The discharge of pus through the fistula has the peculiarly fetid odor of osseous caries. The general symptoms of periostitis are present in caries, and, in addition, the diseased bone can be detected by the probe. Caries is most commonly found in children and necrosis in adults.

**TREATMENT.**—The general plan of treatment is very similar to that recommended for cellulitis, as we should at first endeavor to prevent destruction of tissue, but, if that does occur, give the pus free vent. If the bone should be diseased the opening must be kept open and an injection of a solution of carbolic acid 1 to 100, or of the sulphate of zinc gr. x to ʒj may be used with advantage. If any of the loose pieces of the bone are discovered they should be removed. The remedies described under cellulitis are also applicable to this disease; in addition to which we note the following:

**Kali iod.**—This form of potash is one of the most important remedies we possess for periostitis. It is especially adapted to the syphilitic variety, though useful when dependent upon other causes. The pain is usually marked, though may be absent entirely. The lids will often be œdematous. The crude salt in large doses has seemed to act more rapidly than the attenuations.

**Aurum.**—For both periostitis and *caries*, when *dependent upon or complicated with a mercurio-syphilitic dyscrasia*; also useful in strumous subjects. The pains are tense, and seem to be in the bones, are worse at night, bones sensitive to touch and the patient is excessively sensitive to pain.

**Mercurius.**—As described under cellulitis, will be found very



useful in both periostitis and caries, particularly when dependent upon syphilis, as the nocturnal aggravation is very marked under both the drug and disease. The different forms are employed according to general indications.

**Silicea.**—Its action upon diseased bones renders it especially valuable in caries of the orbit. The roughened bone and moderately profuse yellow-white discharge are the principal indications, though the weakened general condition, relief from warmth and other concomitant symptoms will be present.

**Calc. hypophos.**—In appreciable doses, has been used as a "tissue remedy" in scrofulous subjects, apparently with good results.

The following remedies may be required: Asaf., Calc. carb., Fluoric acid, Hecla lava, Lyco., Mezer., Nitr. ac., Petrol., Phosphor. and Sulphur.

**Empyema of the Frontal Sinus** is extremely rare. The cause is uncertain. It may occur at any time of life, except in young children. The early swelling and distension are unnoticed, but it finally perforates the bony wall and a swelling appears at the upper and inner angle of the orbit, causing epiphora, displacement of the eye downward, forward and outward, with diplopia. The patient may have had headache for a long time, or it may have caused but little discomfort.

**TREATMENT.**—Similar to that given for cellulitis and periostitis.

**Tumores Orbitæ.**—In the orbit may be found both benign and malignant tumors, which may have developed primarily in the orbit, in some of the neighboring sinuses such as the antrum or ethmoidal, or have spread from the eyeball or face. They usually cause more or less exophthalmos and restriction in the mobility of the eye; the displacement of the eye depends upon the location of the growth. The eye may suffer from inflammation, the optic nerve may become inflamed or atrophic, the retina detached, etc. The examination should be directed to the degree and direction of the exophthalmos; to the impairment in motion, whether in one direction or all; to the feel of the growth, its smoothness, mobility, solidity, pulsation, fluctuation, etc.

We note the effect of pressure upon the eyeball, if it causes pain on being pushed backward, or if the position of the tumor is altered. We inspect the nostrils, the pharynx, the frontal and maxillary sinuses. The tumor may be explored with the hypodermic syringe. The history of the case should be elicited for hereditary tendency, the progress of the growth whether slow or rapid, whether associated with pain or not. All these points and many more should be considered, as an aid to diagnosis, prognosis and treatment. Nearly all varieties of tumors may be found in the orbit, viz.: Osteoma, nævi, angioma, lipoma, fibroma, cysts (dermoid or hydatid), neuro-fibroma, lymphoma, sarcoma, scirrhus, encephalocele, epithelioma, etc.

**TREATMENT.**—The most approved method of treatment of all tumors of the orbit is to remove them as early as possible, endeavoring to save the eye whenever sight is present, unless it be a malignant growth and there is danger of not removing the whole of the tumor without sacrificing the globe; in which case it is usually better to remove all the contents of the orbit. A careful diagnosis must be made before operating, in order to aid in the operation and prevent the opening of a vascular tumor.

Electricity is of great value in removing vascular tumors of the orbit. When the growth is small the negative pole may be applied by a sponge to the temple, but if large both poles should be attached to platinum needles, two or three inches in length, which are then to be inserted into the tumor. The positive needle should remain in one position while the negative may be inserted at different points for a few moments at a time. Care should be taken to make the first sitting brief, from fear of a too severe inflammatory reaction.

Our remedies are the same as for tumors in other portions of the body, though we would especially mention *Thuja* and *Kali iodata*, which have been of service in some cases.

**Wounds and Injuries of the Orbit** may prove serious from inflammation of the orbital tissue, or periostitis, which they may cause. Penetrating injuries from knives, shot, pitchforks, etc., cause laceration of the soft parts. Injury causing fracture of the orbital walls may prove more or less serious according to the location and extent of the fracture; a slight lesion of the orbital

margin may heal without trouble; in fracture of the frontal or ethmoidal cells we will usually have emphysema of the orbit and lids, due to an entrance of air into the cellular tissue. If the injury has occurred in the vault of the orbit, we may have a serious inflammation of the brain or its membranes. Fracture of the roof of the orbit has frequently been found with a fracture of the base of the skull. Out of 86 cases of fracture of the base of the skull, fracture of the orbital roof was found in 79.\* Hæmmorrhage into the cellular tissue is very apt to occur in all injuries or wounds of the orbit, hence exophthalmos is usually present. Foreign bodies of large size have frequently remained imbedded in the orbital tissues for a long while without creating any material disturbance.

TREATMENT.—When a foreign body has penetrated the orbit it should be removed as soon as possible, after which cold compresses of calendula in solution, or the ice bag should be applied.

Injuries with an effusion of blood into the orbit, causing the eye to protrude, will be benefited by a cold compress and a firm bandage. In emphysema of the orbit and lids a compress bandage will be required.

### **Morbus Basedowii** (*Exophthalmic Goitre, Graves' Disease*).

SYMPTOMS.—The main symptoms of this disease are: rapidity of the heart's action, enlargement of the thyroid and protrusion of the eyes, although any one of these symptoms may be absent. The acceleration of the heart's action is the earliest, most constant and essential symptom, and this may reach from 100 to 200 beats per minute and may be weak and irregular. Linnell † in an excellent paper on this disease calls attention to one case in which there was no change in the pulse beat, whether sitting or standing, the usual variation returning as the case improved. The heart symptoms are usually first developed, followed later by the enlargement of the thyroid and the exophthalmos either simultaneously or in succession. The goitre may develop suddenly, has a soft, elastic feel, a visible pulsation, and a systolic murmur on auscultation. The enlargement of the thyroid and the

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\*Berlin: Graefe and Saemisch, *Handbuch der Augenheilkunde*, 1880.

† Trans. Amer. Inst. Homœ., 1892.

exophthalmos are originally due to vascular engorgement. The exophthalmos is almost universally bilateral, though it may be confined to one side. The degree of protrusion varies. It may be so excessive that the lids are unable to cover the eyes, and ulceration of the cornea may result from the exposure. The protrusion is straight forward, causes no interference with the movements of the eyes, and the eyes may be pressed back into their normal position, but will become prominent again on relief of the pressure. The exophthalmos gives the patient a frightened, staring appearance. On turning the eyes downward the upper lid does not follow it at all, or moves along for a certain distance and then remains stationary. This peculiarity, called Graefe's sign, because first noticed by him, is of much diagnostic value, because highly characteristic of this disease, and is rarely found in exophthalmos from any other cause. Other symptoms of this disease are dyspnoea and excessive nervousness. There is usually excessive nervous excitability and tremulousness of the hands. The disposition is often changed. The patient is easily frightened and flushes readily. Epistaxis or hæmorrhage from other parts may occur. Dilatation and pulsation of the retinal arteries has been observed. Anæmia is often present, and in women may be associated with menstrual disturbances; rapid emaciation may occur in some cases.

COURSE.—The disease as a rule is very chronic, lasting for several years with frequent temporary improvements and relapses; the symptoms may then gradually subside, though often some enlargement of the thyroid or exophthalmos will remain permanently. Rarely death occurs in this disease, especially in men in advanced life, from organic disease of the heart or exhaustion. The majority of these cases, however, practically recover.

CAUSES.—Basedow's disease is much more often found in women than in men, some authorities claiming that over 85 per cent. of all cases are found in women. The majority of cases occur between the age of puberty and thirty in women, while the average age in men for the appearance of this disease is from thirty to fifty.

This disease has at various times been attributed to a disease of the sympathetic, to rheumatism, etc., and, while its cause has not yet been definitely demonstrated, it will probably be found in



some central lesion located in the gray matter of the third and fourth ventricles, the vaso-motor centre and the origin of the pneumogastric. It is generally brought on by some mental shock, by exhaustion from disease, excessive hæmorrhages, or severe labor.

**TREATMENT.**—To promote a permanent cure, rest, especially in the country; freedom from all excitement, especially emotional; exercise in open air; a generous diet, and abstinence from all stimulants, are particularly required and should be insisted upon whenever practicable. Galvanization of the sympathetic in the neck has been followed by very good success in many instances, especially when combined with internal medication.

**Amyl nit.**—Cases have been entirely cured by olfaction of this drug alone. The eyes are protruding, staring, and the conjunctival vessels injected, as well as those of the fundus. Especially indicated when there are frequent flushes of the face and head, oppressed respiration, etc.

**Badiago.**—Exophthalmic goitre, with aching pain in the posterior portion of the eyeballs, aggravated on moving them, accompanied by tremulous palpitation of the heart and glandular swellings. The pulse is rapid and irregular.

**Cactus grand.**—Cases of exophthalmic goitre have been improved, when prescribed on the heart symptoms.

**Ferrum.**—Both the iodide and acetate have been followed by favorable results, especially when the disease comes on after the suppression of the menses; protruding eyes, enlargement of the thyroid, palpitation of the heart and excessive nervousness. Linnell found good results from the simultaneous use of Iron and Digitalis in one case, after both had been tried separately with no benefit.

**Lycopus virg.**—Judging from its provings, in which we find a rapid, irregular, intermittent and very compressible pulse, together with a bellows murmur over the heart and large vessels, it should be a valuable remedy in this disorder. Linnell (*loc. cit.*) reports very gratifying results from the use of this remedy.

**Spongia.**—Exophthalmos, enlargement of the thyroid and palpitation of the heart, great uneasiness and easily frightened, especially at night; stitches in the ball and burning around the eyes, with lachrymation in the light; the eye feels twisted around;



chromopsies, especially deep red, and photopsies, even when the eye is closed at night—all indicate this drug, which has proved serviceable.

Mr. Hulke\* recommends Aconite, and Dr. Samuel Wilks Belladonna.

*Nat. mur.* and *Baryta carb.* are reported to have cured well-marked cases. Other remedies which have been recommended are Ars., Bell., Brom., Calc., Iod., Phos., Sil., Sulph. and Veratrum alb. and viride.

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\* Trans. Ophthal. Soc., Vol. VI.

## CHAPTER X.

## Affections of the Ocular Muscles.

**Anatomy.**—The movements of the eyeball are carried on through the action of six voluntary muscles; four of these passing directly from their origin, around the optic foramen, to their insertion in the sclerotic, are called the recti muscles. These muscles are inserted at varying distances, from 5.5 to 8 mm. from the corneal margin, and are distinguished by their relations to the eyeball, as internal, external, superior and inferior rectus. The insertion of the internal rectus is the nearest to the corneal margin, and that of the superior rectus is the most posterior.

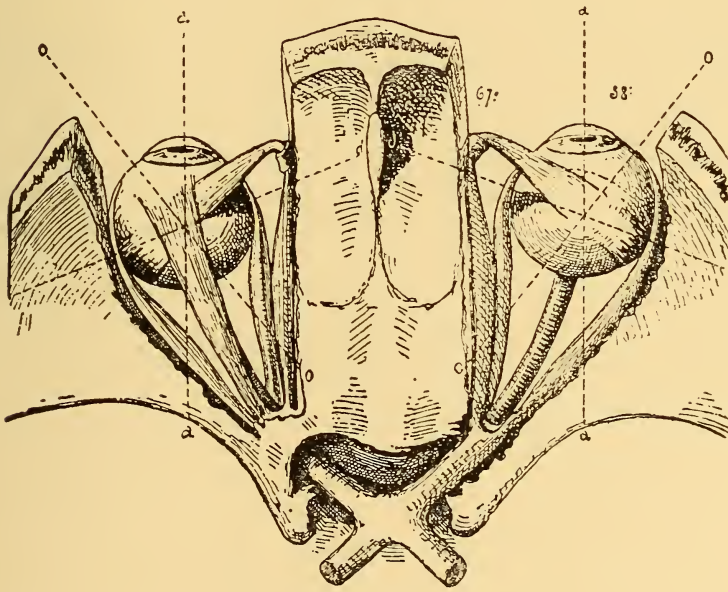
The remaining muscles, from their taking a curved direction around the eyeball, are known as the superior and inferior oblique muscles. The superior oblique arises at the optic foramen, passes forward along the upper part of the inner orbital wall to a pulley attached at the superior-internal angle at the front of the orbit; from here it is reflected backward and outward between the superior rectus and the eyeball, and is inserted into the sclerotic, 16 to 18 mm. from the corneal margin on the posterior and outer part of the globe, between the superior and external recti.

The inferior oblique arises from the inner and anterior part of the floor of the orbit and passes outward and backward between the inferior and external recti and the globe, and is inserted near the superior oblique, between the superior and external rectus, 17 to 19 mm. from the corneal margin. The internal, superior and inferior recti and the inferior oblique are supplied by the *third nerve* (oculomotorius), the superior oblique by the *fourth* (patheticus) and the external rectus by the *sixth* (abducens).

The action of all these muscles is to turn the eye around a point, called the *centre of rotation*, situated on the antero-posterior axis of the globe, about 14 mm. behind the anterior surface of the cornea and about 10 mm. in front of the posterior surface of the

sclera. These six muscles form three pairs of antagonistic muscles. The axis of rotation of the internal and external recti is vertical, as these muscles turn the globe directly inward and outward. The axis of rotation of the superior and inferior recti is horizontal, although not exactly straight across; it forms an angle of  $67^{\circ}$  with the visual axis, the nasal end of the line being in front of the temporal and is the axis of elevation and depression. The axis of the superior and inferior oblique is also horizontal, forming an angle of  $38^{\circ}$  with the visual axis, with the temporal extremity in front of the nasal, and the movements about it are those of rotation. (Fig. 47.)

FIG. 47.



Axes of ocular muscles.

Taken singly, the muscles act as follows: The internal rectus draws the cornea directly inward (adduction), the external rectus turns the cornea directly outward (abduction), the superior rectus turns the cornea upward and slightly inward, the inferior rectus turns the cornea downward and slightly inward, the superior

oblique, taking its point of action from the pulley through which it passes, turns the cornea downward and outward and rotates from above downward; the inferior oblique turns the cornea upward and outward and rotates it from below upward.

Each movement of the eye results from the combined action of certain muscles, and there is never a period at which one or the other is entirely inactive, as by its living and elastic tension it aids in guiding a definite movement, even though it does not take part in it. In looking directly upward both the superior rectus and inferior oblique are brought into action, the inclination inward of the former being counteracted by the outward tendency of the latter, and so in all other movements of the eye the action of all the muscles must be considered. Paralysis of any one muscle will cause all movements of the eye to be less sure.

The function of the ocular muscles is to secure single vision with the two eyes by directing both eyes to the point of fixation in such a manner that the image of the object fixed shall fall simultaneously on the macula lutea of each eye. When this is done, all objects lying in the same horopter will form images upon the respective retinæ which will be equidistant from the fovea centralis and will, therefore, be appreciated as single, giving what is called binocular vision.

The *horopter*, as described by Müller, is represented by a circle which passes through the centres of rotation of each eye and through the apex of the point of fixation of the visual lines. All objects beyond or inside the horopter will cast images on parts of the retinæ not equidistant from the fovea and will create the impression of two objects or double vision; for example, holding two pins in the same line, one eight inches and the other twenty from the eyes, on looking at the nearest pin the other is seen double, and *vice versa*. This double vision of objects not lying in the horopter causes no annoyance, because the mind ignores the impression of objects with which it does not concern itself. The symmetrical position of the physiological centres of the retina is the anatomical ground for binocular vision. If a distant object be fixed with parallel lines of vision, to fix an object at one side which throws its image in both eyes at an equal distance from the macula lutea, both eyes must move through an equal angle; consequently, equal innervation on both sides is necessary for the

symmetrical movements of the eyes. All objects are seen single only when retinal images fall on corresponding points of the two retinae.

*Homonymous Diplopia.* If the visual line of the left eye be directed on an object and there is convergence of the right eye, the image, which would in the left eye be formed on the fovea in the right would fall upon the retina to the inner side of the fovea and would be projected outward to the right of the object fixed, or homonymous diplopia.

*Heteronymous Diplopia.* If there is divergence of the right eye at the time the visual line of the left eye is directed upon an object, the impression from the object fixed would in the right eye fall upon the retina to the outer side of the fovea and when projected outward would appear to the left of the object fixed, causing crossed or heteronymous diplopia. The displacement of the false image is always in the direction which is opposite to that of the deviation of the eye. When the eye deviates inward, the diplopia is homonymous; when outward, heteronymous; when upward, the false image is below, and, when downward, it is above. The false image is the image of the deviating eye.

*Binocular Diplopia* is present when the visual axis of one eye deviates from the object of fixation.

*Monocular Diplopia* is due to the formation of two images of the same object upon *one* retina and exists when the other eye is closed. As in binocular diplopia there is one image cast upon each one of the two retinae the diplopia disappears on closing either eye, while if the diplopia persists on closing one eye, it is then monocular. The cause of monocular diplopia is either an anomalous refraction or a double pupil.

**Paralysis of Ocular Muscles.**—We may have one or more muscles paralyzed, and the cause may be either orbital or intracranial; if the latter, it may be along the course of the nerves or in the brain. Lesions of the spinal cord may cause paralysis through fibres which proceed to the brain.

**SYMPTOMS.**—The characteristic indications of paralysis are false position of the eye, limitation and irregularity in motion, and double images. As secondary effects, we find dizziness, nausea, headache, incorrect projection of the field of vision and inability



to guide the hands or feet aright. Indistinct vision may occur in cases of slight paralysis, where actual diplopia is absent due to an overlapping of images. If only one eye is involved the inclination is to close it. Another peculiar effect is the attitude which the head assumes to obviate the double images. It is turned toward the paralyzed muscle to diminish the diplopia.

CAUSES.—The effective causes are localized periostitis, inflammation of the sheath of the nerves, basilar meningitis, hæmorrhages, tumors, degeneration of nerve structure or of the cerebral nerve centres, injuries, diphtheria, rheumatism, draught of air, etc. The majority of cases of ocular paralysis occur in syphilitic subjects and are most frequently of orbital origin. Paralysis may also be the first premonition of sclerosis of the spinal cord. Both eyes may be affected, and the cause then is intra-cranial and generally basilar. Paralysis may occur at any age and may be temporary or permanent.

DIAGNOSIS.—In paralysis the secondary deviation is always greater than the primary, while in concomitant strabismus the primary and secondary deviations are equal. The *primary deviation* is the deviation of the affected eye when the healthy eye fixes, while the *secondary deviation* is the deviation of the good eye when the affected eye fixes. If recovery does not occur, there follows secondary contraction of the opposing or associated muscle. For example, in paralysis of the right external rectus, from diminished resistance, the right internal rectus will turn the eye unduly inward, and the left internal rectus will also undergo contraction, and, if the right eye looks directly forward, the left will consequently squint inward. This fact in old cases often makes the diagnosis as to which muscle was first affected very difficult.

Theoretically the examination of the double images should render the diagnosis easy and accurate, but in practice the inability of many patients to appreciate and describe the relations of the images, together with secondary contractions and involuntary compensations, makes it oftentimes extremely difficult to attain an accurate chart of the double images. In many recent cases we can tell what muscle is affected without an analysis of the double images. The movement of the eye in the direction of action of the paralyzed muscle is less than normal, and is increased

in the opposite direction; its movements are irregular and jerky. The image of the affected eye is projected—*i. e.*, seems to the patient to lie—in the direction of the paralyzed member. The inclination of the head, when present, will be such as to favor the lamed muscle and will be in its line of action.

When, however, there is any uncertainty as to the muscle affected, the examination of the double images should always be made. The double images are best detected by having one eye covered with a red glass, and the patient to describe the position and inclination of the two lights (one red and the other white) seen when looking at the flame of a candle eight to ten feet away. The images are to be noted in the different parts of the field as follows: First on the level with the patient's eyes directly in front, then to the right and left, and also at about three feet above and below this level at the centre, right and left. The use of the red glass aids the patient in detecting the two images and at the same time informs the physician to which eye each belongs. Paralysis affecting but one single muscle usually attacks either the external rectus or the superior oblique, because each of these muscles is supplied by an independent nerve. Paralysis of several muscles is usually due to the oculomotor nerve.

*Ophthalmoplegia totalis* is a paralysis of all the eye-muscles. In this the lids droop, the eye is directed forward and immovable, pupil dilated and no power of accommodation.

*Ophthalmoplegia externa*, all but the pupil and accommodation affected. Is more frequent than the former and is always of central origin.

*Ophthalmoplegia interna*, only the pupil and accommodation affected.

*Conjugate paralysis* affects associated movements, as to the right or left, etc., eyes will only follow to the median line. As for example to the right, and appears as paralysis right externus and left internus. But left internus will converge in median line showing only affected in associated movements. The cause is a lesion in the association centres of the nerves.

Paralysis may result from a lesion anywhere in the course of the nerve tract, intra-cranial, it may affect the centres in the cortex of the brain (cortical paralysis), the association centers, or the nerve nuclei upon the floor of the fourth ventricle (nuclear par-

alysis), or the nerve trunks along the base of the skull (basal paralysis). Orbital paralyses occur from a lesion of the nerve trunk or its branches after its entrance into the orbit.

**Paralysis, External Rectus.**—Paralysis of the external rectus muscle causes a limitation in the outward movement of the eye. In complete paralysis the eye can only be turned but little beyond the median line, while in incomplete it may often go to nearly the normal limit, but with an irregular, jerking motion. The head is turned toward the paralyzed side. The deviation of the affected eye is inward; the diplopia is homonymous; the double images are on the same level and parallel, and the distance between the images increases on looking toward the affected side. The line which separates that part of the field in which there is single vision from that in which it is double is not exactly vertical, but is inclined obliquely, the diplopia extending further toward the healthy side below than above.

**Paralysis, Superior Oblique.**—The restriction in motion is downward and outward, and in complete paralysis of this muscle the motion downward is diminished. The deviation of the affected eye is upward and inward, and the image of the affected eye is inclined inward at the top, owing to the torsion action of this muscle on the eyeball. The obliquity of the false image is increased on looking toward the affected side. The diplopia is homonymous and present only in the lower part of the field. The image of the affected eye is lower than that of the healthy eye, and the difference in height between the two images is increased on looking downward and toward the healthy side. The image of the affected eye generally appears nearer to the patient than that of the healthy eye. The direction of the healthy eye, when the diseased eye fixes, is downward and inward. The line of demarcation between the true and false images is slightly oblique to the horizontal, the end corresponding to the affected side being lower. The face is inclined downward and to the healthy side.

**Paralysis, Internal Rectus.**—In this, the restricted movement is inward, the affected eye is outward, the diplopia is heteronymous, the double images are parallel and of the same height, the distance between them increases on looking toward the healthy

side and on looking upward. The line of demarcation between the true and false images is oblique to the vertical, the diplopia extending further toward the healthy side above than below. The face is turned in the direction of the affected eye.

**Paralysis, Superior Rectus.**—The restricted motion is upward and slightly inward, the deviation of the affected eye is downward and on looking up is downward and outward; diplopia is slightly crossed and in the upper part of the field the false image is higher than the true, its upper end is inclined to the healthy side; the difference in height between the two images increases on looking upward and the obliquity increases on looking to the healthy side. The line of demarcation is inclined to the horizontal, the diplopia extending lower toward the affected side. The face is directed slightly upward.

**Paralysis, Inferior Rectus.**—In this we find the restricted movement is downward, the deviation of the affected eye is upward and outward, the diplopia is slightly crossed, especially in the lower part of the field; the false images are lower and inclined toward the affected side; the difference in height increases on looking downward and to the affected side, and the obliquity increases on looking toward the healthy side. The line of demarcation is inclined to the horizontal, the diplopia extending higher toward the affected side. The face is inclined downward and slightly toward the affected side.

**Paralysis Inferior Oblique.**—The restricted movement is upward and outward, the deviation of the affected eye is downward and inward, the diplopia is slightly homonymous and especially in the upper part of the field, the image of the affected eye is higher and inclined outward, the difference in height increases on looking upward and inward and the obliquity increases on looking to the affected side. The line of demarcation is inclined to the horizontal, the diplopia extending lower toward the affected side. The face is directed upward and slightly toward the sound side.

**Complete Paralysis of the Third Nerve.**—In this there is ptosis, slight exophthalmos, pupil moderately dilated, accommo-



dation paralyzed; movements are restricted in all directions excepting directly outward; the deviation of the affected eye is outward; there is heteronymous diplopia, the false image is oblique and inclined toward the healthy side; it also appears higher than the true image and nearer to the patient. The distance between the images increases on looking toward the sound side, and the difference in height increases on looking upward. The face is inclined toward the sound side and slightly upward.

COURSE.—Paralysis may occur suddenly or develop insidiously. Relapses may occur, and the course is always chronic. Many cases, especially old ones, are absolutely incurable, and in even the most favorable ones six weeks or more are required for a cure. The prognosis depends mainly upon the cause. Syphilitic and rheumatic cases are the most favorable.

TREATMENT.—The treatment varies according to the nature of the cause, which should always receive due consideration in the selection of a drug. Our chief reliance must be on internal medication.

Prismatic glasses, to which we frequently resort, may be used for two purposes: 1. To relieve the annoying diplopia by giving that prism which neutralizes the double vision. 2. For the purpose of exercising the paralyzed muscle by using a weak prism, which nearly fuses the double images, when by the exercise of the will they may be brought together; by daily using weaker and weaker prisms much improvement can be made in restoring the muscle power.

Electricity is the most valuable agent for the cure of paralysis, and we should employ the constant current, of from two to three milliamperes. The applications should be made daily for from three to five minutes at each sitting, with the negative pole over the insertion of the muscle and the positive at the occiput.

Forcible movements of the eye made by seizing the conjunctiva over the insertion of the paralyzed muscle with the fixation forceps, and strongly turning the eye in the direction of action of the weakened muscle and then in the directly opposite direction, has proved of very great value in my hands. Under Cocaine this causes no pain.

As a last resort, after the condition has existed sufficiently long to render all hopes of improvement by other means impossible,



careful tenotomy of the opposing muscle may be performed, with or without advancement of the paralyzed muscle, according to the degree of deviation.

To overcome the annoying diplopia in hopeless cases, spectacles with a ground glass before the paralyzed eye may be employed.

**Causticum.**—Paralysis of the muscles resulting from *exposure to cold*. It has been especially successful in paralysis of the sphincter pupillæ (mydriasis), of the ciliary muscle, levator palpebræ superioris (ptosis), orbicularis, and external rectus.

**Gelsemium.**—A valuable remedy in all forms of paralysis of the ocular muscles, especially of the external rectus. Paresis from diphtheria, or associated with paralysis of the muscles of the throat.

**Rhus tox.**—A remedy often indicated in paralysis of the ocular muscles resulting from *rheumatism or exposure to cold, wet weather and getting the feet wet*. Causticum is very similar in its action, though it is more especially adapted to those cases resulting from exposure to cold, dry weather.

**Aconite.**—Paresis from exposure to a draught of cold air.

**Kali iodata.**—The iodide of potassium is more commonly indicated than any other drug in *paralysis of the muscles of syphilitic origin*. Appreciable doses are usually employed.

**Euphrasia.**—Paralysis of the muscles, particularly of the third pair of nerves, caused from exposure to cold and wet; especially if catarrhal symptoms of the conjunctiva, blurring of the eyes, relieved by winking, etc., are present.

**Senega.**—Want of power of the superior rectus or superior oblique, in which the *diplopia is relieved by bending the head backward*. The other muscles may be complicated in the trouble.

**Arnica.**—Paralysis of the muscles resulting from a blow or injury.

**Chelidonium.**—Paresis of the right external rectus. Distant objects are blurred, and on looking steadily two are seen. Pain in the eye on looking up.

**Cuprum acet.**—Insufficiency or paralysis of the external rectus muscle.

**Merc. iod. flav.**—Paralysis of the third pair, especially if syphilitic in origin.

**Nux vom.**—Paresis or paralysis of the ocular muscles, particularly if caused or made worse by the use of stimulants or tobacco.

**Paris quad.**—Paralysis of the iris and ciliary muscle, *with pain drawing from the eye to the back of the head; or pain as if the eyes were pulled into the head.* Eyes sensitive to touch.

**Phosphorus.**—Paralysis of the muscles caused or accompanied by spermatorrhœa or sexual abuse.

**Spigelia.**—When associated with *sharp, stabbing pain* through the eye and head.

Alumina, Aurum, Conium, Hyoscyamus and Sulphur have also been used with advantage.

### The Localizing Value of Paralysis of Orbital Muscles in Cerebral Disease.

**PARALYSIS OF THE THIRD NERVE.**—Ptosis may be present in cortical lesions without any other branch of the third nerve being paralyzed. Ptosis on the same side as the lesion indicates a disease of the pons, if on the opposite side a lesion in the crus cerebri. Paralysis of the third nerve as a whole is usually present in lesions of the cerebral peduncle. Paralysis of the whole or part of the third nerve on the same side as the lesion, coming on at the same time as crossed hemiplegia, indicates a disease of the crus cerebri. The most frequent causes of oculomotor paralysis are basal lesions and usually affects all of its branches. Complete paralysis of all the branches of this nerve with no other paralysis present is always basal. Lesions in the interpeduncular space may also cause total or partial paralysis of the third nerve. Thrombosis of the cavernous sinus invariably produces paralysis of the third nerve, but all the orbital nerves and the fifth may also be affected.

**PARALYSIS OF THE FOURTH NERVE** alone is extremely rare, one case on record where due to tumor of the pineal gland, but is more apt to be of basal origin, and is frequently double. May occur in meningitis, from exudation between corpora quadrigemina and the splenium of the corpus callosum according to Pfungen.\*

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\*Wien. Med. Blätt, Nos. 8-11, 1883.

It has been found with paralysis of the third in lesion of the cerebral peduncle.

**PARALYSIS OF THE SIXTH NERVE** when the only focal sign usually results from basal disease. It is also especially liable to occur from distant pressure, and Wernicke says, particularly from a tumor of the cerebellum. Paralysis of the sixth with hemiplegia of the opposite side indicates a lesion in the pons. The facial is frequently involved with the sixth in the lesion of the pons.

**PARALYSIS OF THE FIFTH NERVE** with hemiplegia of the opposite side points to disease in the pons.

**Strabismus or Squint** is inability to bring the visual axes of both eyes to meet at a certain point, or when the point fixed casts its image only on the macula lutea of one eye, while in the other it falls on some eccentric part of the retina. If the squinting eye deviates inward, it is called strabismus convergens; if outward, divergens; if upward, sursum vergens, and if downward, deorsum vergens. The squint in concomitant strabismus differs from that of paralysis in the following points: The primary and secondary deviation are equal in strabismus, while in paralytic squint the secondary deviation is greater than the primary. In strabismus the extent of the movement in the two eyes is normal and equal, while in paralysis the mobility of the eye decreases in the direction of action of the paralyzed muscle. Diplopia is generally absent in strabismus, except at the commencement of the squint; but, when present, is found in all parts of the field, and in strabismus there is no particular inclination of the head.

Strabismus is usually *mono-lateral*, that is a faulty position of one eye; or it may be *alternating*, when the patient will be able to fixate objects with either eye separately, and when doing so the other eye becomes the squinting one. In alternating squint one eye usually is used to fixate distant objects and the other for near objects. The strabismus may also be *intermittant* or *constant*. Strabismus is not observed after death, during deep sleep or in deep narcosis.

Concomitant squint is very seldom accompanied by diplopia. This is believed to be due to a suppression of the retinal image in the squinting eye, for, being that of some object with which the

mind is not interested, it is simply ignored at will. Hansell\* concludes that, "Amblyopia is congenital and not acquired; is not improved by tenotomy when high or of long duration; is always present in monocular squint; is not a factor in alternating squint; can be replaced by full acuity of vision after the hitherto good eye has been rendered by accident or disease inferior to the squinting eye."

*Binocular vision*, according to von Graefe, is absent in about 90 per cent. of the cases of strabismus, that it can be produced by prisms in about 25 per cent., and exists after operation in about 50 per cent. Its presence is proved at once by the existence of binocular diplopia, and when not present it is determined by having the patient look at the flame of a candle at the distance of six or eight feet through a prism placed before one eye, when either diplopia or a corrective squint will occur, if the prism is not too strong, for the patient will endeavor to overcome the prism by squinting and fusing the images, or if neither of these effects occur, absence of binocular vision is proven. Binocular vision is frequently only lost over certain portions of the retina.

The visual acuity of the squinting eye is diminished. This may exist before the development of the squint and may be one of the reasons for squinting.

*Apparent Strabismus* is the condition where there is a deviation of the optic axes, and yet both eyes fixate and neither moves when the other is closed. This is due to the relation between the optic axis and the visual line. If the optic axis lies to the outer side of the visual line, we have an apparent divergent squint and, if to the inner side, may have the reverse—an apparent convergent squint.

**Strabismus Convergens** is the most common form of squint met with, and usually develops between the second and seventh years of life. Diplopia is generally present in all cases which develop later than childhood.

**CAUSES.**—In a great majority of cases it is found to exist in connection with hypermetropia. Donders first called attention to the relation of hypermetropia to convergent strabismus, and showed it to be present in about 75 per cent. of the cases; other

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\* Journ. Amer. Med. Assoc., Feby. 16, 1895.



authorities since then have placed it as high as 85 per cent. It has also been estimated that about 16 per cent. of all hypermetropes squint. It is usually the median or slight degrees of hypermetropia that most often induces strabismus. Hypermetropia causes strabismus on account of the normal or physiological relation between convergence and accommodation; that is, with an increase of convergence the relative range of accommodation approaches the eye. All hypermetropic eyes require a strong tension of the accommodation for distinct vision, and hence to aid the accommodation they are inclined to converge too much. As a result of too strong continued convergence the hypermetrope soon learns to give up binocular vision because he finds he can secure a more distinct image, with less strain on the accommodation, by monocular fixation.

In the high degrees of hypermetropia there will be but slight cause for sacrificing binocular vision when, in spite of too strong convergence, distinct retinal images cannot be obtained. In the medium and lower grades of hypermetropia there does exist the inclination to exchange binocular vision for monocular fixation when any cause makes binocular fixation less valuable, as in differences in refraction, astigmatism, corneal opacities, etc., affecting only one eye. It has also been found by Schweigger and others that the non-squinting eye does not possess full acuity of vision, and this induces squint by an effort to secure by convergence as large an image as possible.

Another contributing factor in the causation of convergent squint is an insufficiency of the external recti muscles, which arises from the fact that in hyperopia there is a deviation inward of the visual lines, and the constant effort necessary on the part of the external recti to maintain parallelism of the visual lines finally results in insufficiency, which favors strabismus convergens. As other predisposing causes we find constantly working in poor light, excessive use of the eyes for near work, weakened ciliary muscle and constant looking to one side. Convergent squint may also be found in myopic eyes, due to a preponderance of the internal recti. Macula of the cornea also cause squint from confusion of the retinal images, which cannot be suppressed while falling upon identical points of the two retinae;



hence the eye turns, in order to throw the image upon some eccentric part of the retina where it may be suppressed, and the eye is more apt to turn in on account of the greater strength of the internal rectus.

In convergent strabismus amblyopia is usually present in the squinting eye. The amblyopia is considered by some to be a consequence of the squint and by others as the cause. It is probable that both views are correct, and that in some cases it is the cause of the squint, while in others the amblyopia results from the squint. It is easy to understand that the squinting eye will become amblyopic from long disuse, and in these cases, where it is a consequence of the squint, it is called *amblyopia ex anopsia*; in other cases, where there may be a difference in the degree of the

FIG. 48.



Lawrence's strabismometer.

hypermetropia in the two eyes, the child would naturally use the best eye for vision and allow the poorer eye to turn, in order to more readily suppress the indistinct image. Hence we must conclude that a slight pre-existing amblyopia in one eye, associated with hypermetropia, will have a tendency to cause convergence, and after the squint has become established the amblyopia may increase from disuse.

Strabismus convergens is by far the most common form of squint met with, and is, in the majority of cases, a stationary monolateral squint. The degree of the strabismus can be obtained sufficiently accurate for all practical purposes by means of the *strabismometer*—an ivory scale shaped to fit the lower lid and graduated in millimetres on its free edge (Fig. 48). It is used by covering the good eye and fixing with the squinting eye, the 0 on the scale is then placed directly under the centre of the pupil, the good eye is then uncovered and the squinting eye allowed to resume its ordinary position; the number then exactly under the

centre of the pupil gives the linear measure of the deviating eye in millimetres.

**Strabismus Divergens** is much less frequently seen than convergent squint and generally develops later, after childhood has passed. It is frequently in the beginning periodic, but usually becomes permanent later; it may also be alternating; generally, however, it is monolateral and concomitant, in that the deviation of the affected eye, or primary deviation, will be equal to the deviation of the good eye, or secondary deviation. Diplopia is usually present at the commencement of the affection, especially when periodic, but gradually disappears as the condition advances. A spontaneous cure never takes place in divergent squint.

**CAUSES.**—While convergent strabismus is usually associated with hypermetropia, divergence is, on the other hand, most often associated with myopia. About 65 per cent. of all cases of divergent squint are myopic. The myope requires little or no accommodation for near vision, hence impulse for convergence is too weak. With this functional insufficiency of the interni, the increased dimensions of the myopic eye adds a mechanical impediment to convergence. Myopes therefore are predisposed to divergence and particularly when one eye has less visual power than the other. As myopia increases the demand for convergence increases owing to the approximation of the near point, but the strain upon the accommodation and the impulse to convergence decreases. The convergence finally is no longer able to answer the demand upon it and the eye turns out. This occurs first when fixating near objects and in some cases never exists except at the near point, but usually later on the eye deviates out at all times.

In some cases where there is myopia of one eye and emmetropia or hypermetropia of the other a similar process ensues: the myopic eye will then usually be used for near vision, because it is impossible to secure binocular vision for reading, and as the myopic eye can be used without any exertion of the accommodation, it is almost invariably used, while the other eye is used for distant vision. Macula of the cornea may also cause divergence as well as convergence, if in such a location that suppression of the indistinct image can be more readily obtained by turning the eye outward instead of inward.

**Strabismus Sursum and Deorsum Vergens** are usually seen as a complication of lateral deviation and disappear when the lateral deviation is relieved. A concomitant vertical deviation, however, may occur alone, and, when it does, is increased, if an upward deviation, on looking inward, and if downward the squint is the greatest on looking outward. Diplopia is usually present in cases of vertical deviation.

**TREATMENT OF STRABISMUS.**—This should first be directed toward preventing the development of the squint. Whenever a tendency to squint is noticed, the child should be prevented from reading, writing and all near use of the eyes as much as possible. As soon as the child is old enough to wear glasses the refractive error should be corrected. My rule is to wait until they are about five years old, and then to prescribe a glass of about a .25 to a .50 D less than the total refractive error as shown by the ophthalmoscope, to be worn constantly. The use of atropine to paralyze the accommodation, and thus preventing near vision, if continued for several weeks, will often greatly benefit an inclination to convergent squint. If the case is one of permanent strabismus, and an early operation is not desired, the *good* eye should be covered for a short period daily and the child compelled to use the affected eye. In this way the vision of the squinting eye will be retained. The fact must also be borne in mind in the treatment of convergent squint that there is a tendency in some cases to a gradual disappearance of the squint as the child grows older, and, when this does occur, it is usually not earlier than the tenth year and often much later.

The use of remedies has in the early stages of many cases relieved the tendency to permanent strabismus.

**Cicuta vir.**—Indicated in strabismus convergens occurring in children, particularly if spasmodic in nature, or caused from convulsions, to which the child is subject.

**Jaborandi.**—Strabismus convergens, periodic and resulting from spasm of the internal recti; also for the return of squint after operation.

If helminthiasis has been the cause, Cina, Cyclamen or Spigelia may be required. If due to spasms, convulsions, or any intracranial disorders, Agar., Bell., Eserine, Gels., Hyos., Nux or Stram. would be first suggested to our minds.

*Operative Treatment* for strabismus may be by either tenotomy of the contracted muscle, advancement of the weak or opposing muscle, or by both combined. The operation for the relief of squint was first suggested by Taylor in the seventeenth century; his method, however, was unsuccessful, and, consequently, abandoned. In 1839, Dieffenbach made the first successful operation for squint; the method practiced by him was to divide the belly of the muscle instead of its tendon, thereby greatly impairing the action of the muscle and often causing the eye to turn in the opposite direction. At a later period von Graefe placed the operation upon a scientific basis by suggesting the division of the tendon instead of the body of the muscle, and his operation, with some slight modifications, is the one in more common use at present. As to the time when the operation should be made, my preference is to wait until the child is ten years of age, unless it is a very pronounced permanent squint, when a tenotomy, aiming to correct only a portion of the squint, may be made at a much earlier age.

A simple tenotomy corrects a convergent squint of three or four millimetres, but in divergent squint not more than two millimetres. As the effect of the operation in divergent squint decreases afterwards, the attempt should be made to get an over-correction. To correct a divergence it is usually necessary to make the tenotomy in both eyes and often an advancement is also needed.

As to the advisability of operating on one or both eyes at the same sitting, authorities seem to be about equally divided. It is, however, always my rule to operate upon but one eye at a time, taking at first the eye with the greatest deviation and making a free division of the muscle, and a few weeks later making a second operation upon the other eye, if needed. Previous to operating we should determine the cause of the squint, the vision, the relative power of the muscles, and the degree of the deviation in each eye. The *technique* of the operation is the same, irrespective of the muscle operated upon.

The result to be obtained from the operation is merely cosmetic, as the vision in the squinting eye is not improved and binocular vision is only restored in a few instances.

*Tenotomy of the Internal Rectus.*—As this operation is quite painful, an anæsthetic should be used. Four to six instillations of



a 4 per cent. solution of cocaine at intervals of about five minutes renders the operation painless, and is to be preferred to a general anæsthetic because we are better able to judge of the effect accomplished. In young or excessively nervous subjects, ether or chloroform may have to be used. The instruments required are a speculum, fixation forceps, curved scissors and strabismus hook (Figs. 49 to 53). The lids should be widely separated by the

FIG. 49.

Mittendorf's  
speculum.

FIG. 50.

Fixation  
forceps.

FIG. 51.

Strabismus  
hook.

FIG. 52.

Steven's  
hook.

FIG. 53.

Blunt-pointed,  
curved strabismus  
scissors

speculum; the conjunctiva and subconjunctival tissue directly over the insertion of the muscle to be divided is seized with the fixation forceps, and with a pair of curved, blunt-pointed scissors, make a vertical cut down to the muscle, which is then separated from the subconjunctival tissue by dissecting backward with the



scissors as far as it is desired to have the muscle slide for its re-attachment. The strabismus hook is now to be introduced behind the muscle at its lower edge, and, with the point pressed against the eyeball, turned upward beneath the tendon, which is then to be divided close to its insertion by cutting from the point to the base of the hook. The hook should then be inserted again to see if all the lateral expansions of the tendon have been divided; but too frequent and extensive excursions of the hook should be avoided, as it tends to increase the inflammatory action. Care must be exercised that too extensive dissections of Tenon's capsule, both above and below the muscle, are not made, as the capsule of Tenon serves as a secondary attachment for the ocular muscles, and, if too freely separated from the sclerotic, the effect of the operation may be too greatly increased and the power of the muscle so much affected that it will have little or no action upon the movements of the eye. The sinking of the caruncle is also the result of a too free dissection of Tenon's capsule.

The use of the suture to limit the effect of the operation, if too extensive, may be necessary; it is introduced through the conjunctiva at the margin of the cornea and then through the conjunctiva over the muscle. In convergent strabismus, with good vision in both eyes, the patient should be able after the operation to fixate and hold the eyes on an object at a distance of about six inches, but if the operated eye ceases to converge, or begins to diverge at eight inches, ultimate divergence may be expected. If the vision is poor, or the muscles weak, a convergence at eight or ten inches is sufficient. Diplopia, with the images near together for two or three days after the operation, is not unfavorable, as it is usually due to the inflammatory action and disappears as the inflammation subsides.

The effect of an operation for convergent squint may be increased, if desired, by a strong suture passed through a fold of the conjunctiva at the outer side near to the cornea, and then carried through the skin at the external canthus, one end above and the other below, about one-eighth of an inch apart, and then tied; or they may be fastened to the skin by strapping. The eye is thus held in the proper position for two days, when the muscle should have become reattached and the suture removed.

*Subconjunctival Tenotomy* is preferred by some to the operation

just described. This is made by snipping the conjunctiva along the lower edge of the insertion of the muscle with blunt straight scissors (Fig. 54). The subconjunctival tissues are then separated over the muscle and the strabismus hook inserted, catching up the muscle on the hook. The scissors are now introduced, one blade in front and the other behind the muscle, which is held on the stretch by the hook, and it is divided subconjunctivally.

*Advancement of the Muscle* is designed to increase the power of a muscle by shortening it. This operation is useful in cases of

FIG. 54.



Blunt-pointed straight scissors.

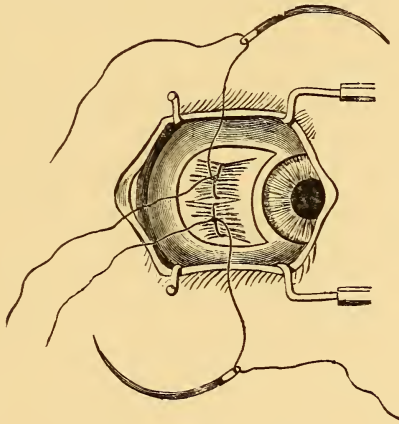
extreme divergence and especially in those cases where the operation for convergent strabismus has resulted in a deviation in the opposite direction, and hence the internal rectus is the muscle most frequently advanced. A tenotomy of the opposing muscle is usually necessary and is generally made at the same time.

In advancement of the internal rectus the conjunctiva over the tendon is divided as for tenotomy. The conjunctiva between the cornea and the opening is separated from the sclerotic with the scissors. The tendon is then caught upon the hook and held by an assistant. A suture is next introduced from the upper margin between the tendon and the sclerotic, and passed through the tendon at the median line some distance back of its insertion. Another suture is passed through the tendon from below in the same way. Each suture is then firmly tied on the tendon, a long end being left to each. (See Fig. 55.) The tendon is now to be divided at its insertion, and the sutures passed forward under the conjunctival flap, the upper to the upper margin of the cornea and the lower to the lower margin. The sutures are then tied separately; the tighter they are drawn the further is the tendon advanced. The operation for advancement devised by Stevens and described on page 184 under heterophoria is a particularly neat and simple

operation where but little effect is desired, but where great effects are required we have found the single suture is apt to cut through from the excessive tension.

*The After-Treatment.*—Simple tenotomy creates no serious reaction, and the patients are allowed to return to their homes and to use their eyes as much as is desired. The use of the ice bag, bathing the eyes in cold water or a solution of calendula gives some relief of the soreness experienced for the first day or two. No bandage should be allowed (except while returning home from the operation), for with protection of the eyes there is not that incentive to parallelism of the visual axes which occurs when the eyes are being used. The advancement of a muscle is accompanied by considerable pain and swelling, which is usually controlled by keeping the patient in bed with both eyes bandaged, the ice bag applied locally and Aconite given internally.

FIG. 55.



Operation of advancement.

**Nystagmus** (*Oscillation of the Eyeballs*).—These movements are involuntary, exceedingly rapid, almost rhythmical and affect both eyes at the same time. The mobility of the eye is not otherwise impaired. The oscillation is generally in the horizontal direction, but may be rotatory, vertical, or in the direction of a single muscle. It is usually permanent, but may be periodic and in some positions of the eye may have a point of rest. Nystagmus

is increased in near vision and from excitement; in some cases it is complicated by similar movements of the head, but in an opposite direction. The sight is always impaired, but objects are seen as they are by the patient. Nystagmus is not infrequently associated with squint.

**CAUSES.**—Generally occurs in early childhood and is principally the result of amblyopia, as in congenital opacities of the cornea, congenital cataract, or total blindness. Nystagmus may be a symptom of cerebral disease, especially disseminated sclerosis.

The nystagmus of miners is a peculiar form of this affection, which first comes on while working in the darkness of the mines, and, as it progresses, lasts through the day, but increases as twilight comes on and has often associated with it night-blindness. These patients are often made dizzy and greatly annoyed by the apparent movement of objects. This form of nystagmus is due to the work done in an insufficient light and with the eyes turned in an unnatural position and often disappears on giving up their work in the mines.

**PROGNOSIS.**—When once developed, it generally remains, although it may diminish somewhat in advanced life.

**TREATMENT.**—If strabismus coexists with nystagmus, tenotomy of the contracted muscle should be made. If there is any anomaly of refraction, it must be corrected with glasses.

**Agaricus.**—Very useful in all spasmodic affections of the muscles of the eye, especially if *associated with spasm of the lids*, or general chorea. *Twitchings of the lids* varying from frequent winking to spasmodic closure of them. *Twitchings of the eyeballs* with various sensations in and around them, chiefly pressing and aching. Eyeball sensitive to touch. *The spasmodic movements are absent during sleep, but return on waking* and may be transiently relieved by washing in cold water.

**Belladonna.**—If accompanied by headache and hyperæsthesia of the senses.

**Hyoscyamus.**—Spasmodic action of the eyeballs.

**Ignatia.**—Morbid nictitation and spasmodic affections occurring in nervous, hysterical women.

Jaborandi, Physostig., Nux, Puls. and Sulph. have also been used with benefit, as may any of that class of remedies denominated our antispasmodics.



**Muscular Asthenopia.**—This term is applied in a general way to various tired and strained sensations about the eyes and head resulting from insufficiency of some of the extrinsic muscles of the eye. Special attention was first directed to this subject by von Graefe, which until within a few years had received but meagre attention and had been applied especially to an insufficiency of the internal recti muscles. Within the last five or ten years, however, hardly a number of our current ophthalmological literature has appeared without containing more or less reference to some of the muscular anomalies. To Dr. George T. Stevens is due the credit of having been the one to first turn the present attention of ophthalmologists in this direction, and, while we cannot accept in full his methods of treatment, must acknowledge that by his efforts researches in this line have been greatly advanced and stimulated. An exhaustive consideration of the insufficiencies of the ocular muscles is of course impossible within the limits of an ordinary text-book, and it is for this reason, presumably, that none of the more recent works upon the eye give this subject the attention that it should receive.

It is a well recognized fact that defects of the ocular muscles can and do cause various reflex disorders, such as vertigo, general nervous excitements, gastric derangements, neuralgic pains of the back, head, etc. On the other hand, many asthenopic symptoms of the eye may be the effect of some remote disorder such as uterine disturbances, etc. In treating of muscular asthenopia we shall adopt the terms suggested by Dr. Stevens as more accurately describing the various forms of insufficiency, viz.: *Orthophoria*: Normal adjustment of the eye muscles. *Heterophoria*: Abnormal adjustment of the eye muscles. *Esophoria*: A tendency of one or both eyes to deviate toward the nose. *Exophoria*: A tendency of one or both eyes to deviate toward the temple. *Hyperphoria*: A tendency of one eye to rise above the level of its fellow. *Hyperesophoria*: A tendency upward and inward. *Hyperexophoria*: A tendency upward and outward. The designation "right" or "left" must be applied to these two terms.

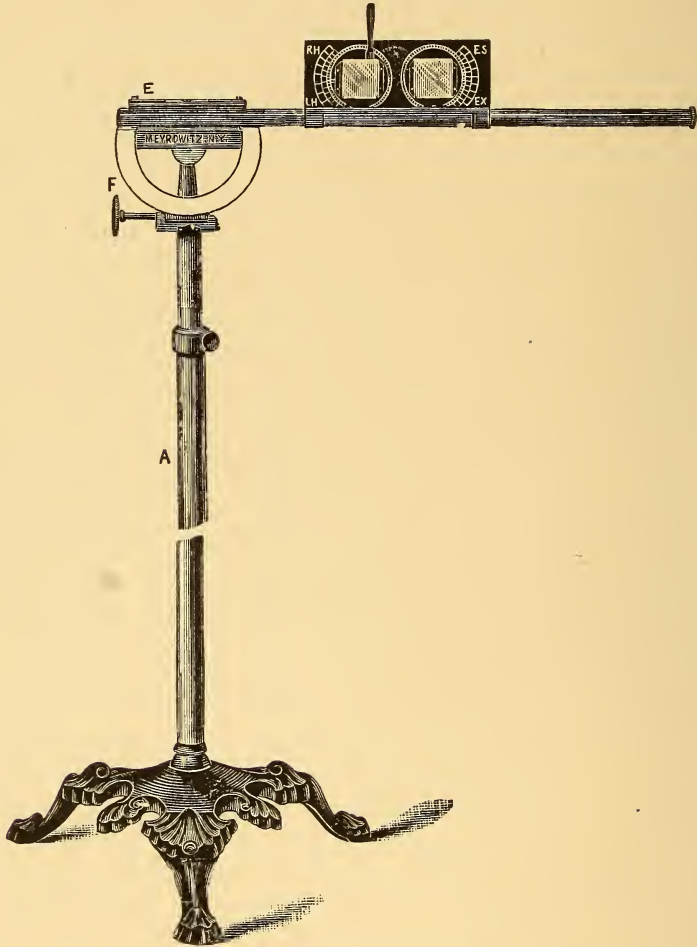
The examination for heterophoria may be practiced by a number of methods.

*Stevens' Phorometer* (Fig. 56). In this test the patient, while



holding the head erect, looks at a lighted candle at the distance of twenty feet, which should be upon a level with the eyes. Then with the refractive error, if any, corrected, prisms of sufficient power to produce diplopia are placed with the base inward before

FIG. 56.



Stevens' phorometer.

each eye. The images thus produced are homonymous, and, if seen exactly on the same horizontal plane, there is no tendency to a vertical deviation. If, however, one image is higher than

that of the other, there is absence of the vertical equilibrium, or *hyperphoria*. If the left image is higher than the right, it indicates that the visual line of the right eye has a tendency to rise above that of the left; this is *right hyperphoria*. If the right image is seen above that of the left, it is known as *left hyperphoria*. The degree of the deviation is shown by the prism, which, when placed with the base up or down before one eye, brings the two images exactly on the same horizontal plane. Diplopia is again induced by placing a prism with the base up or down before one eye, and, if the two images are now exactly vertical, no deviation in the horizontal plane is shown. A prism of  $7^\circ$  is usually sufficient to cause vertical diplopia when placed with the base up or down before one eye. Say, with the base down before the right eye, if now, the upper image appears more at the right than the lower, it indicates *esophoria*; but, if the upper image is to the left of the lower, *exophoria* is shown. The degree of the horizontal deviation is shown by the degree of the prism which, when placed with the base in or out before either eye, brings and holds the images in a vertical line.

In the Stevens instrument the degree of the deviation is found by rotating the test prisms. The amount being indicated on the scale on the face of the prisms.

Examination should then be made in the same way at the distance of eighteen inches to determine the condition of the muscles in accommodation, and for this purpose a small white cross on a black background is used in the Stevens' phorometer.

Many oculists claim the examination as to the muscular balance in accommodation is of no consequence. This the writer believes to be a grave error, as in the very large majority of cases the troubles complained of are only present, or at least markedly worse, when using the eyes at near vision. There is no question but that the muscular balance in the majority of instances is decidedly different in accommodation than it is in distant vision, and as the eyes are used for a large percentage of the time at near vision the condition of the muscles in accommodation is, therefore, of the utmost importance.

*The Maddox Test* is made by a small glass rod, which may be mounted or held in the hand, and, for hyperphoria, is held exactly vertical before one eye. A red glass may be placed before

either eye to more clearly show the two different objects, the line of light and the flame. When looking at the lighted candle, a long horizontal line of light is seen by the eye in front of which the rod is held, while the other eye sees the natural light. Now, if the line of light passes exactly through the centre of the flame, as seen by the other eye, there is no hyperphoria present; but if above or below, then hyperphoria is shown, and the degree is represented by the prism which causes the line of light to pass directly through the centre of the flame. The rod is now turned horizontally in front of one eye, causing a vertical line of light which, if passing directly through the flame, shows orthophoria of the lateral muscles; if the line is to the same side as the eye before which the rod is held, it indicates esophoria; if to the opposite side, exophoria, and the prism which brings the vertical line of light directly through the flame indicates the degree of esophoria or exophoria. This we believe to be the most reliable test for muscular insufficiency at present devised.

*The Savage Test for Insufficiency of the Oblique Muscles.*—Occasionally cases of undoubted eye-strain are met with which are not relieved even after the most careful correction of the refractive error or of any of the already named forms of heterophoria. These cases may be due to an insufficiency of one of the oblique muscles, a condition easily detected by Savage's test; but if found, there has been at present no satisfactory suggestion offered as to treatment.

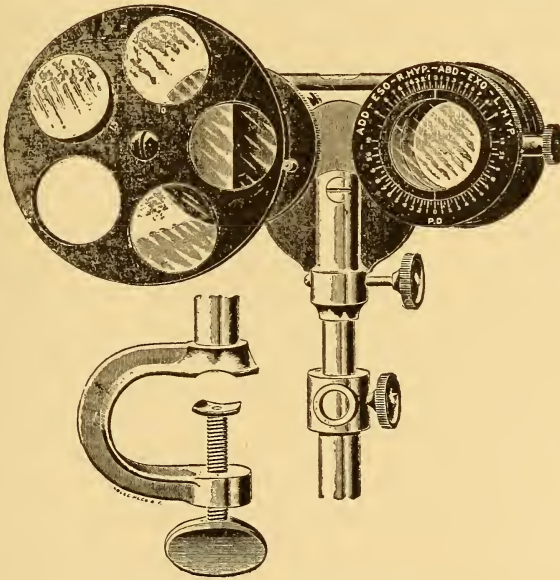
In testing, a double prism of six degrees each, base to base, is held with its axis vertical before one eye and the patient requested to look at a horizontal line on a card eighteen inches away. With the other eye covered, the line appears to be two, each parallel with the other; on uncovering the other eye, a third line is seen between the other two, with which it should be exactly parallel. If there is any loss of balance between the oblique muscles, this test will show a lack of parallelism of the middle line with the other two, the right end of the middle line will point to the lower line and the left end to the upper line, or *vice versa*.

With the double prism before the right eye, if the middle line is seen nearer the bottom, there is left hyperphoria; if it extends farther to the right than the other two, and not so far to the left,

exophoria is present; or, if reversed, extending farther to the left and not so far to the right, esophoria is shown. If the right ends of the middle and lower lines converge, insufficiency of the superier oblique of the left eye is shown; if they diverge there is insufficiency of the left inferior oblique. By changing the double prism to the left eye, the right eye may be similarly tested.

*The Harold Wilson Phorometer.*—Of the many different kinds of phorometers now upon the market, the Wilson, in the author's opinion, is far better than any other, because in the one instrument are combined the Stevens, the Maddox and the Savage tests. Its accuracy, ease and rapidity of working make it the instrument *par excellence*. As oftentimes the results of the examination of the muscles by the different methods vary the value of having all the different tests in one instrument is at once apparent.

FIG. 57.



The Harold Wilson phorometer.

**Hyperphoria.**—By this is meant the condition of the ocular muscles in which there is a tendency of one eye to rise above the level of its fellow. Hyperphoria should be designated as right or



left. In right hyperphoria the image of the right eye is higher than that of the left, the right eye standing lower its image is projected above that of the left and *vice versa* in left hyperphoria. This term does not imply that the visual line referred to is too high, but that it is higher than the other, without indicating which may be at fault.

SYMPTOMS.—This condition is apt to cause far greater disturbance than any other variety of heterophoria. A greater or less degree of amblyopia is, according to Stevens, found in a large per cent. of the cases of hyperphoria, and is by him attributed to suppression of images, owing to the inability of the muscles to maintain the two eyes on the same horizontal plane. Spasmodic closure of the lids and involuntary contractions of the muscles of the face may be present. The head is apt to be carried toward the shoulder. Constitutional effects, such as neuralgia, headache, persistent nausea, pain in the back, vertigo and neurasthenia have undoubtedly been caused, and relieved by the correction of an existing hyperphoria. Examination as to the power of the muscles in overcoming prisms with the base up or down should always be made. The usual strength in normal eyes will vary from  $3^{\circ}$  to  $8^{\circ}$ , and I have found those who could fuse the images through a prism of  $12^{\circ}$  with the base up or down.

**Esophoria.**—Is a condition of insufficiency of the external recti muscles or a tendency to convergence of the visual lines. The method of determining esophoria has been already described, but quite frequently examination reveals an esophoria at the distant point and exophoria in accommodation. In such cases the presence of hyperphoria should always be suspected.

Esophoria as a cause of muscular asthenopia has received but very brief attention in text-books upon ophthalmology, and yet that it can and does cause many annoying cases of asthenopia is now being recognized by the advanced thinkers in this department. Noyes (*loc. cit.*) states that out of 100 consecutive cases of muscular asthenopia, 74 were cases of insufficiency of the external recti (esophoria).

Stevens states (*loc. cit.*): “In respect to the clinical importance of esophoria, which occurs in the proportion of more than three to one of exophoria (this has been modified in a later article by



Stevens to a proportion of two to one), it plays a much more important rôle than the latter as a predisposing cause to a variety of neuroses; and, as the immediate cause of asthenopia and kindred affections about the eyes, it is an element of great disturbance." My own experience, however, has shown a larger proportionate per cent. of cases of exophoria than has been found by the authorities quoted. This difference has probably been due to the fact, that it is our practice to base the diagnosis, in those cases frequently met with, in which there is found esophoria at the distant point and exophoria in accommodation, upon the condition which seems to be creating the most disturbance. That is, if the asthenopic symptoms are only caused upon use of the eyes at the near point, the case then, we believe, should be considered one of exophoria; and if the distress occurs after use of the eyes at distant vision, one of esophoria. We believe, oculists generally base the diagnosis upon the results found from examination at the distant point alone, and too frequently ignore the loss of muscular equilibrium in accommodation.

**SYMPTOMS.**—The disturbing effects from esophoria are more obscure and remote than in exophoria. The patient affected with esophoria is apt to suffer from headaches at the back of the head and neck, a general sense of illness, nausea, vertigo, etc., on the day following a visit to a picture gallery, an attendance at church or theatre, from driving or riding on the cars, in fact from any use of the eyes to maintain parallelism of the visual lines at distant objects. While in exophoria the patient is more apt to suffer with pains in the eyes or head immediately after one or two hours use of the eyes for reading, sewing, etc. There is often a weakened power of accommodation, with dilatation of the pupil present. They often complain of the annoyance of seeing their nose, or of seeing a black spot before their eyes. Amblyopia is the rule in cases of esophoria exceeding  $2^{\circ}$  (Stevens). Esophoria is found to be almost invariably of a higher degree when the eyes are under atropine.

Examination as to the power of the external recti muscles in overcoming prisms base in shows the average strength to vary from  $10^{\circ}$  to  $14^{\circ}$ , yet an abduction of  $6^{\circ}$  may not be incompatible with orthophoria. In some cases of esophoria I have seen a power acquired of overcoming prisms of  $24^{\circ}$  base in, and still an examination would reveal esophoria.

**Exophoria.**—Insufficiency of the internal recti, or tendency of the eyes to divergence, is, we believe, in spite of the experience of others, the most common form of muscular disturbance. This, it would seem natural to expect, especially in the educated classes, from the constant over-use of the internal recti at the near point.

**SYMPTOMS.**—In exophoria we find the most characteristic symptoms on using the eyes, the pains are generally in the eyeballs, the patient wants to rub and press them for relief. Often a blurring of the vision; the letters seem to run together. The headaches occur especially after using the eyes for near work, and are more often frontal, but may be in any part of the head. The power of accommodation in exophoria, contrary to that in esophoria, is usually increased; this is owing to the relation existing between convergence and accommodation, the insufficiency of the internal recti demands and results in greater action of the accommodation. Examination of the power of the internal recti for overcoming prisms will, like the other muscles, give most variable results; in some cases orthophoria will be established when an adduction of  $20^{\circ}$  is reached, but usually an adduction of upward of  $70^{\circ}$  will readily be acquired by a little exercise. I have also seen an adduction of  $80^{\circ}$  reached in many cases, and the tests still showed an exophoria.

**HETEROPHORIA AND ITS TREATMENT.**—The definition of heterophoria, as given by Stevens, of an abnormal adjustment of the eye muscles, or a tending of the visual lines in some other direction than parallelism, applies as well to strabismus, and the difference between the two conditions must be borne in mind. In heterophoria binocular vision is habitually maintained, but by the expenditure of a greater amount of force than is demanded in the perfect equilibrium of the ocular muscles. In strabismus there is, on the contrary, habitual diplopia, though, as a rule, the subject, by long suppression of one image has become unconscious of it. Therefore, the dividing line between heterophoria and strabismus should rest on the habitual ability or failure to maintain binocular vision.

In no ophthalmic disorder has it been found so necessary to individualize the case as in muscular insufficiency. Sometimes the highest degrees of heterophoria may be present without asthenopic symptoms, headache or nervous disturbances, while, upon the

other hand, the lowest degree may give rise to an aggravated train of symptoms.

Locomotor ataxia, chorea, epilepsy, acute mania and other mental disorders are claimed and undoubtedly have been cured, in some cases, through correction of the heterophoria.

When we come to consider the delicate mechanism of the eye and the important part that the ocular muscles perform in the carrying out of the function of this organ, one must become convinced that any insufficiency on their part *may* serve to create various asthenopic symptoms, headaches, neuralgias and reflex nervous disturbances. We must, however, decry the tendency of some enthusiasts to attribute all ills that flesh is heir to, to heterophoria.

As regards the treatment of heterophoria we wish to reiterate our statement of six years ago, viz.: We desire first to *most emphatically protest against the too prevalent operation of graduated tenotomies*. While graduated tenotomies are still being made as frequently as ever by a few enthusiasts, specialists as a rule now only resort to operative measures in exceptional cases. It is to be sure far more brilliant to give the sufferer relief by operative measures than by a more or less tedious course of treatment, but have we the right to permanently lame or weaken the power of any muscle so long as the desired end, relief of the patient, can be attained by any other method? In all forms of heterophoria there is either an insufficiency of one muscle or a preponderance of strength in its opposing muscle, and in order to secure relief the normal equilibrium between these two muscles must be restored. It seems to the writer more rational to consider the mass of cases to be the result of a muscle weakened by overuse, rather than a faulty insertion, or an abnormal strength of the opposing muscle. The theory of tenotomy is to weaken the action of the stronger muscle so that the normal balance between it and its opposing muscle may be re-established. The theory of treatment is to strengthen the weaker muscle and thereby re-establish the normal balance. In either method the proper equilibrium is restored: in the first plan by means of two weakened muscles and in the latter by two strong muscles. I have seen many cases where tenotomies have given prompt and marked relief for a time, but in six months or a year later they have fallen back into

an even worse state than at first. I do not wish to be understood as claiming that no case requires operative treatment, for some of them can only be relieved by operation; but *first* the weaker muscle should be strengthened to its *utmost* limit, and then, if relief is not given and the normal balance not restored, a graduated tenotomy may be made.

Heterophoria of some kind or degree may be found in nearly every person, and frequently a very high degree be present without causing any disturbance. In all such cases when the patient is not suffering from eye-strain or any reflex symptom no treatment for the heterophoria should be undertaken.

*The Operation of Graduated Tenotomy*, as suggested and practiced by Stevens, is as follows: Three or four instillations of a 4 % solution of cocaine should be made at intervals of four or five minutes, the eyelids then being separated with a speculum, a fold of conjunctiva exactly over the center of the insertion of the muscle is seized, and with the scissors a transverse incision not exceeding one-half of a mm. in length is made through this membrane; with the forceps, pressing the outer cut edge of the conjunctiva backward, the tendon of the muscle is seized in its centre a little behind its insertion and divided with the scissors. The delicate Stevens' hook is then inserted through this opening in the centre of the tendon and the opening enlarged by careful division of the tendon toward the borders until the desired effect is acquired. Under cocaine the patient experiences no pain, and the extent of the operation is regulated by frequent examinations with the phorometer. If too extensive, it may be limited by a very fine suture inserted through the centre of the divided muscle and through the conjunctiva at the inner side of the wound and tying it only sufficiently tight to have the desired effect.

*Stevens' Advancement Operation.*—The eye is cocainized and the conjunctiva opened as in tenotomy. The tendon is seized with the fixation forceps at the exact center of its attachment to the sclera and a free tenotomy made. The forceps remain attached, or a silk loop is passed through, to hold the tendon and to act as a guide to its exact center. The tendon is then drawn out and the connective tissue between it and the conjunctiva loosened. When the tendon has been drawn out sufficiently to reach the



point desired for its new attachment it is seized at that point by a fixation forceps, and a V-shaped piece cut out with the apex toward the new attachment of the forceps. A fine, but strong suture is now passed sufficiently behind the forceps to insure a good hold, and then through the conjunctiva and some of the sclera near to the cornea and tied. The patient should be tested with the phorometer immediately after the operation and the aim should be to secure a few degrees of excess over the actual amount required, as usually several degrees of effect are lost during the first forty-eight hours owing to stretching or partial cutting out of the suture. It is always well to cover the eyes for one or two days after an advancement to prevent traction upon the suture until some degree of new adhesion has taken place.

As already stated, however, the operation, we believe, should be held as a *dernier ressort*, and treatment first directed toward increasing the power of the weaker muscle. This is best accomplished by the use of prisms to exercise and strengthen the muscle, precisely on the same theory as other voluntary muscles of the body are strengthened by the use of dumb-bells, exercise in the gymnasium, etc.

In *hyperphoria* my practice is to give the patient prisms, set in spectacle frames, with the base up in one eye and down in the other of sufficient strength to cause vertical diplopia with the images near together. These are to be worn daily for from ten to twenty minutes, after the double images are fused while looking at objects in the room and at greater distances. The strength of the prisms are increased from time to time, as the superior and inferior muscles gain power and are able to overcome the prisms. The degree of the hyperphoria should be tested frequently to learn when to stop the exercise, that it may not be overdone. I have found in some cases that an ability to overcome prisms of  $12^{\circ}$  (a prism of  $6^{\circ}$  base up in one eye, and of  $6^{\circ}$  base down in the other) can be acquired by this exercise, but usually they will be only able to overcome prisms of from  $5^{\circ}$  to  $8^{\circ}$ ; and oftentimes the hyperphoria will be corrected when even a power to overcome a weaker prism than this is acquired.

In *esophoria* precisely the same method is followed, but of course with the base of the prism set in, toward the nose, before each eye. In this exercise a power of overcoming prisms of from  $12^{\circ}$  to  $16^{\circ}$



(divided between the two eyes) is usually obtained, and as high as  $24^{\circ}$  has been acquired.

In *exophoria* my method of exercising with prisms is entirely different. For this, prisms one and a half to two inches square are used. The patient is seated from fifteen to twenty feet from a lighted candle, a prism of sufficient strength to produce horizontal diplopia with the images near enough together to be readily fused, is then held with the base out before one eye, by an effort of the patient the lights are brought together and held one for a moment, when this is removed and a stronger prism placed before the eye. This procedure is followed, using stronger and stronger prisms, so long as the eye can fuse the images; then the other eye is put through the same training, and the exercise should then cease for that sitting. My experience has been that the best results are gained in exercising the internal recti every other day; that they will usually gain from  $2^{\circ}$  to  $10^{\circ}$  at each sitting, and should always be exercised to the same degree at least as the previous sitting, in order to hold all gain that is made. The prisms should always be held so that the images are on the same level, else they cannot be fused. In some cases it is necessary to use a red glass before one eye, so that the patient can more readily recognize the two images. In low degrees of *exophoria* the patient should always be exercised by the surgeon; but, where there is considerable *exophoria*, he may be ordered a set of prisms, shown how to use them and carry out the exercise at home, but always under the direction of the surgeon. My usual directions are to exercise up to a certain degree, when they are to report for examination; if *exophoria* is still present, they are allowed to go on to a still higher degree, and so on. The power of the internal recti to overcome prisms is readily increased in nearly every case to upward of  $60^{\circ}$  and in the majority to upward of  $70^{\circ}$ .

Results from exercising with prisms are always more prompt and satisfactory in cases of *exophoria* than in either *hyperphoria* or *esophoria*, as the internal recti, having much greater power normally, seem to respond more readily to the systematic exercise.

Prisms may also be used for another purpose, viz.: To correct the *heterophoria*. In this case they serve as a crutch to remove the strain from the weaker muscle. In prescribing prisms for this purpose it is better, as a rule, not to put on the full correction of

the heterophoria, and they should not be ordered at all until after the prismatic exercise had been carried to its full extent without relief. They should, however, as a rule be worn in preference to an operation, for after their use for some time the muscles may regain their normal balance and the prisms be discarded. Very flattering results have followed the wearing of even a  $\frac{1}{2}^{\circ}$  prism.

In all cases the refraction should be carefully examined, and usually it is necessary to make a thorough examination under atropine. If any error is detected, it should be as carefully corrected, for an uncorrected refractive error is undoubtedly the cause, in many cases, of the heterophoria, and its correction will often cure the heterophoria without other treatment. The muscular equilibrium should be especially examined, *while the glasses to be used both at distance and in accommodation are on*, before prescribing them, *because convex glasses will increase exophoria and diminish esophoria*. Many cases of esophoria associated with hyperopia will be wholly corrected by the use of the proper convex glass, which should be as nearly as possible the glass which causes orthophoria both in distance and in accommodation. On the contrary, in exophoria associated with hyperopia the weakest glass possible, or none at all, should be prescribed. Concave glasses will have an opposite effect on exophoria and esophoria to that of convex glasses. Examination of hyperopic eyes under atropine will always show a much higher degree of hyperopia when esophoria is present than when there is exophoria, and hence stronger convex glasses should always be prescribed in hyperopia when esophoria is present than where there is exophoria.

*It is, therefore, important to always test the muscles with the eyes in the state they are to be used, viz., with their glasses on.*

The effect of glasses for refractive errors on heterophoria can be aided by either combining prisms or by decentering the lenses; the decentering of the lens gives the same effect as the combination with prisms without the annoyance of the additional weight. As a rule, but a very low degree prism can be worn for distant vision. The effect that can be secured by the decentration of lenses is also very limited varying, of course, with the strength of the lens.

Another method of toning up a weakened muscle which may be employed with benefit is forcible stretching of its antagonist in

the following manner: After cocainizing the eye take hold of the eyeball firmly with the fixation forceps over the insertion of the impaired muscle; then force the eye strongly in the direction in which the muscle acts, carrying it also moderately in the opposite direction. Do this two or three times at one sitting. This can be repeated at intervals of from two days to a week.

Both faradism and galvanism have also proved of much value in the restoration of muscle power. Galvanism seems to have given the best results in my hands, and is now universally employed in all cases immediately after the prism exercise, using from two to four milliamperes, the positive pole applied to the temple, and the negative, through a small ball electrode, to the lid directly over the insertion of the impaired muscle. Locally the patient is advised to apply to the closed eyelid three or four times each day a solution of equal parts of brandy and water or a weak solution of the remedy used, especially Ruta. Gels., or Senega.

Internal medication for the relief of asthenopic symptoms is of the first importance.

**Ruta grav.**—*Aching in and over the eyes*, with blurring of the vision after using or straining the eyes at fine work. The *eyes feel hot* like balls of fire, appear irritable and run water, especially toward evening after working all day.

**Onosmodium.**—*Heaviness and dullness of the eyes*. Dull, heavy pains and soreness of the eyeball. Tense, drawing and tired feeling in the ocular muscles. Pain in and over left eye. *Pains in the left side of the head*. Dull, heavy pain in the occiput with dizzy sensations, eyes feel as though they were wide open, vision blurred. *Great muscular prostration and tired feeling over the entire body*. The muscles feel unsteady and treacherous, as though you dare not trust them to move.

**Gelsemium.**—Asthenopia, with weakness of the external recti, or if associated with blepharitis or hyperæmia of the conjunctiva. Soreness of the eyeballs. Drawing over the eyes. Diplopia which can be controlled by an effort of the will.

**Senega.**—Is a remedy of especial value in cases of asthenopia from hyperphoria. Confused feeling in the head. *Dullness of the head, with pressure and weakness of the eyes*. Tired, aching or pressing pains in or around the eye, smarting and burning of the

eyes. The headache is of the whole head and not centered in any particular spot, and is often relieved in the open air. Aggravation of all the symptoms upon use of the eyes.

**Natrum mur.**—No remedy is more often indicated in asthenopia than this. The vision soon becomes dim and the letters run together upon using the eyes for near vision and sometimes for distant vision. The internal recti are usually weak. *The muscles feel stiff and drawn and ache on moving the eye in any direction. Pain in the eye upon looking down.* Burning, smarting, itching and heat in the eyes upon reading or writing, with a variety of other sensations, even headache. Heaviness and drooping of the lids on use of the eyes for near vision. The eyes appear irritable, with some dread of light, so the patient desires to close them firmly.

**Sepia.**—Smarting in the eyes and a variety of other sensations may be experienced, as can be seen by reference to the verified symptomatology. *Aggravation of the symptoms morning and evening.*

**Argentum nit.**—Letters blur, and sight vanishes on reading or writing.

**Cinnabar.**—Asthenopia, *with pain in the inner canthus, extending above or around the eye*, worse in the evening and upon using the eyes. Soreness over exit of supra-orbital nerve.

**Aconite.**—Asthenopia from over-use of the eyes. Lids spasmodically closed, with a heavy feeling in them; while the eyes *feel very hot and dry* after using. Conjunctiva may be hyperæmic. Cold water may relieve temporarily the heat in the eyes.

**Agaricus.**—Asthenopia, especially muscular, if accompanied by sudden *jerks of the ball*, twitching of the lids, etc.

**Calcarea.**—Pale, flabby subjects, inclined to grow fat; with coldness of the extremities and perspiration about the head. Eyes pain after using. and are generally worse in damp weather and from warmth. Burning and cutting pains in the lids, and sticking pains in the eyes on reading. Dim vision after fine work. Objects run together.

**Conium.**—Letters run together on reading. Burning pain deep in the eye. *Great dread of light.*

**Kalmia.**—Stiff drawing sensation in the muscles upon moving the eyes (Nat. mur.).



**Lachesis.**—Asthenopic symptoms, especially in the left eye, with a variety of pains and sensations, worse upon thinking of them, using the eyes and on waking in the morning.

**Lilium tig.**—Burning, smarting, and heat in the eyes after reading, relieved in the open air (Pulsat.). Photophobia.

**Mercurialis peren.**—Asthenopia, with a sensation of dryness of the eyes and heaviness of the lids. Mist before the eyes in the morning. Burning pain in the eyes in evening, and upon reading.

**Phosphorus.**—Mistiness and vanishing of vision, with pain and stiffness in the eyeball. Light aggravates, so the patient is better in the twilight. Muscæ volitantes. Photopsies.

**Rhododendron.**—Insufficiency of the internal recti muscles, with darting pains through the eyes and head, *always worse before a storm.*

**Spigelia.**—If accompanied by *sharp, stabbing pains* through the eye and around it, extending back into the head.

In addition to the above, many other remedies have been employed with success. Attention is particularly directed to the following: Ammon. carb., Apis, Arn., Asarum, Carbo veg., Caust., Crocus, Euph., Ignat., Kali carb., Ledum, Lith carb., Macrotin, Nux vom., Paris quad., Phos. ac., Pulsat., Santon, and Sulphur.



## CHAPTER XI.

## Diseases of the Conjunctiva.

**Anatomy.**—The conjunctiva is the delicate mucous membrane lining the inner surface of the eyelids; from the lids it is reflected upon the globe and covers the sclerotic as far as the cornea, with which it becomes continuous. The conjunctiva is divided into three portions: the *palpebral*, covering the inner surface of the lids; the *bulbar*, covering the sclerotic; and the *fornix*, or loose folded portion connecting these two. At the cornea the conjunctiva overlaps the cornea slightly, and at this point is called the *limbus conjunctivæ* or *corneæ*. The bulbous portion of the conjunctiva is formed of three layers—the external epithelial layer, the fibrous tissue and the subconjunctival tissue.

The epithelial layer is formed of cylindrical cells externally and a deeper layer of smaller cells. The fibrous tissue is a fine reticulated structure, containing nucleated cells, together with a few elastic elements. The subconjunctival tissue is loose and elastic, with fibres uniting it to the sclerotic. The conjunctiva, especially the portion covering the lid and forming the cul-de-sac, contains numerous lymphatic follicles and acinous glands.

The nerve supply of the conjunctiva is very free and is derived from the fifth pair. The blood supply is also extremely abundant, especially in the region of the limbus and around the caruncle.

The function of the conjunctiva is to act as a lubricating surface.

**Hyperæmia of the Conjunctiva.**—In the strict sense of the word, hyperæmia is but the preliminary stage of different diseases, yet in the conjunctiva it is often the only symptom, and is, therefore, considered here as an independent condition.

**SYMPTOMS.**—The vessels have the appearance of a coarse network. The transparency and smoothness of the conjunctiva is

lost and the papillæ of the lids are more marked. The eyes are red, feel hot and heavy, and as though there was sand in them; there is a smarting, itching and a tired feeling on using them, or from exposure to a bright light.

CAUSES.—The most frequent cause is a prolonged effort of the accommodation in those who have some uncorrected error of refraction, exposure to severe cold or heat, or from foreign bodies. Often seen in those living or working in a vitiated atmosphere. It is also frequently associated with nasal catarrh, hay fever, etc.

COURSE.—It may be either acute or chronic, and when chronic it may cause a blepharitis, or become a catarrhal conjunctivitis.

TREATMENT.—See *conjunctivitis catarrhalis*.

**Conjunctivitis Catarrhalis** is a hyperæmia of the conjunctiva plus a discharge from the membrane—a simple hypersecretion. The healthy conjunctiva secretes mucus mixed with effete epithelial cells, and, when abundant, it becomes tenacious, stringy and with it small masses of pus. The difference between catarrhal and purulent ophthalmia is simply one of degree; in catarrh the secretion contains elements of pus, but still is never really purulent, and is much less likely to destroy the corneal epithelium by maceration than does the purulent.

SYMPTOMS.—These are the same as found in hyperæmia, but of a higher degree; the itching, smarting and burning sensations, the photophobia, lachrymation and redness of the eye are all present, and, from the greater inflammation and infiltration, we have chemosis. The discharge from the eye may be more or less excessive, but of a bland or muco-purulent character. The amount of secretion varies, and at night it is apt to accumulate and cause crusts on the cilia. The patient often complains of a temporary blurring of vision and black spots before the eyes, due to small flakes of secretion passing in front of the pupil.

COURSE.—An acute attack does not usually last more than from one to three weeks, although it may run into the chronic form, especially in cachectic persons, or from unfavorable surroundings. In the chronic form the discharge is less contagious, and the disease is often associated with an inflammation of the lachrymal sac, especially if one eye only is affected.

CAUSE.—In the acute form, where there is a muco-purulent dis-

charge, it is certainly contagious. It may appear as an extension of a nasal catarrh, from an affection of the eyelids, or from an inflammation of the lachrymal sac. Frequently occurs from an exposure to cold, from dust or smoke, from confinement in a close or vitiated atmosphere; often due to refractive errors, and is apt to occur with the exanthemata.

DIAGNOSIS.—As other diseases of the eye may very closely resemble a catarrhal conjunctivitis, the differential diagnostic points should be considered. The principal diseases usually mistaken for conjunctivitis are iritis, episcleritis and keratitis.

#### DIFFERENTIAL DIAGNOSIS.

Conjunctivitis.	Iritis.	Episcleritis.	Keratitis.
The redness of the conjunctiva is general, and on pressure through the lower lid the injected vessels are seen to move with the membrane over the sclerotic. There is always redness of the fornix conjunctivæ, and usually of the palpebral conjunctiva. There is a muco-purulent discharge, more or less profuse. The iris is clear and bright, the pupil reacts readily to light and the cornea is clear.	The redness is deep-seated, surrounds the cornea as a rosy zone, and is not accompanied by redness of the fornix or palpebral conjunctiva. The injected vessels are beneath the conjunctiva, and do not move with it. The iris is discolored, pupil sluggish and inactive and the vision is impaired. There is usually very severe pain in the eye and head, which is generally worse at night.	The redness is of a dusky-red color, is subconjunctival and localized; it is most often situated over the external rectus muscle, or over the internal. There is usually little or no pain, and the duration of the disease is much longer.	The redness is deep-seated, and usually most marked around the cornea. The transparency of the cornea is always more or less diminished. The photophobia is more intense and the lachrymation more profuse. The vision may be greatly impaired.

TREATMENT.—The first point in the treatment should be the removal of any exciting cause. To accomplish this the lids should first be everted and examined for the presence of a foreign body, which, if detected, should be removed. If the conjunctivitis depends upon any anomaly of refraction, this should be cor-

rected. If due to straining of the eyes in reading, writing, etc. (especially in the evening), or exposure to wind, dust or any bright light, as working over a fire, directions to abstain from over-use, or to protect the eyes from the injurious causes, should be given. Should the case be very severe, the patient may be confined to his room, though this is rarely required in pleasant weather. As a local remedy in acute inflammation of the conjunctiva, the use of *ice* is especially recommended. It may be used in rubber bags made for that purpose or by wrapping it in a towel. If prescribed it should be used *constantly* for twenty-four or forty-eight hours or longer, according to the benefit derived. Cleanliness especially should be required. To prevent the formation of crusts on the lids, the edges may be smeared at night with a little vaseline, simple cerate, cream or the like.

In conjunctivitis, after the acute symptoms have subsided, we sometimes find the inflammation will come to a standstill, notwithstanding our most careful selection of remedies. In these cases a mild astringent will be found advisable, and the two following prescriptions have proven of much value:

℞. Sodæ biboratis,	.	.	.	.	.	.	.	℥j
Aquæ camphoratae,	.	.	.	.	.	.	.	ʒiij
Misce.								
℞. Zinci sulph.,	.	.	.	.	.	.	.	gr. ij
Sodii chlorid.,	.	.	.	.	.	.	.	gr. iv
Aquæ dest.,	.	.	.	.	.	.	.	ʒi
Misce.								

Instil a few drops in the eye four times a day. Atropine should not be used unless there is iritic complication.

The attendants should be warned that the discharge is contagious, and that the sponges, towels, etc., used upon the patient should not be employed for any other purpose.

The administration of the internal remedy is, as a rule, all that is necessary in this disease. In the following list of remedies will be found those most frequently indicated. For special indications see *Remedies in Conjunctivitis*, page 214. Acon., Pulsat., Euphras., Apis, Rhus, Sulph., Arsen., Merc. sol., Hepar, Graph., Bell., Sepia, Allium cepa, Alumina, Argent. nit., Calcareæ Caust., Cham., Cinnabar., Ignat., Nux vom., Sang., Zincum.



**Conjunctivitis Purulenta or Blennorrhoea.**—(*Ophthalmia Neonatorum, Conjunctivitis Gonorrhoea*). An acute inflammation of the conjunctiva with a purulent discharge may occur at any time of life, and bears essentially the same features, whether occurring in the infant soon after birth, or in the adult as a result of infection from a gonorrhœal or other discharge. It is, however, more commonly spoken of under the heading of its two principal causes as ophthalmia neonatorum and conjunctivitis gonorrhoea; but, as the pathology, symptoms, course and treatment are practically the same, they will be generally described under the one heading, reserving for each a brief mention of its characteristic peculiarities.

**PATHOLOGY.**—No great changes take place in the conjunctiva. It simply becomes infiltrated with serum, together with a proliferation of cells and lymphoid elements; the blood-vessels become dilated, the capillaries increased in number and there is also some thickening of the epithelium. The contagiousness of this disease is due to micro-organisms, the gonococci of Neisser, which are found in the pus secreted by the conjunctiva and also in the superficial layers of the conjunctiva itself.

**SYMPTOMS.**—All those of catarrhal conjunctivitis are present in a much higher degree. The most prominent symptom is chemosis, which may be sufficient to overlap the cornea. This is due to infiltration of the conjunctiva with exudation, which also extends to the lids, causing a violet colored puffiness. The œdema of the lids is so great as to cause ptosis. The papillæ of the conjunctiva are elevated and form villi, which bleed easily and give a thick, swollen appearance to the conjunctiva of the lids. Another most prominent symptom is the discharge, which at first is thin, mucopurulent, but soon becomes distinctly purulent, a thick yellow secretion, and is so excessive that the eye and cheek become literally bathed in pus.

At first there is a feeling of heat, smarting and burning pains in the eye, then ciliary pains and shooting pains in the head set in. In some there is a distinct febrile movement. The swelling of the lid becomes hard and tense, making it difficult for even the physician to open them, and of a dusky red color—the upper lid over-hanging the lower.

The first stage, or *stage of infiltration*, lasts from two to four



days, in which the disease has reached its height. The second stage, or that of *pyorrhœa*, succeeds in which the swelling of the lids and the tense infiltration of the conjunctiva decreases. With this there begins a profuse secretion of pus, which gradually lessens as the swelling subsides, and the mucous membrane finally returns to a normal condition in from four to six weeks.

The great danger is an involvement of the cornea, which may occur in three ways, viz.: First, small facets are formed by a loss of the epithelium, which, if seen and watched, may be prevented from extending; if not, they extend deeper, unite and form an ulcer, which may terminate by perforation. Second, there appear toward the centre of the cornea grayish points of infiltration, which increase in size, fuse and tend to form an abscess. Third, infiltration takes place at the margin of the cornea in the form of a ring; and, if this occupies more than a third of the cornea, it indicates an affection of the nutrition and becomes the starting point of a general necrosis, which almost inevitably causes loss of the eye. The cause of this participation of the cornea is due to either direct action of the infectious matter on the cornea, to direct continuity of inflammation to the substance of the cornea, or to the stoppage of the nutrition of the cornea by the chemosis. A clean cut ulcer will sometimes form at the extreme margin of the cornea, under the chemosis, which is liable to perforate, and is particularly dangerous because apt to be overlooked.

CAUSES.—Contagion is undoubtedly the direct cause in nearly every case and the disease breaks out in from a few hours to three days after infection. In infants it usually results from a leucorrhœal or gonorrhœal discharge at the time of birth. In adults the infection is introduced from the genitals, by touching the eyes with unclean fingers and is more often the result of infection from gonorrhœa. Girls have been affected from an ordinary leucorrhœal discharge. Secretions from a diphtheritic conjunctivitis, or an altered or decomposed discharge from a catarrhal conjunctivitis may cause a purulent ophthalmia.

PROGNOSIS is always serious if the cornea is affected, as permanent opacities, staphyloma of the cornea, or even complete destruction of the eye may ensue. Even when the cornea is not affected, do not give a too favorable prognosis, as corneal complications may arise at any time.

**Ophthalmia Neonatorum.**—The ophthalmia of the newly-born child is undoubtedly solely the result of inoculation from a leucorrhœal or gonorrhœal discharge from the vagina or cervix and occurs during birth, or later from the soiled linen or sponges. It is only in cases where the eyes are prematurely opened that they contract the contagion, when due to contact with the virus during labor, and it usually manifests itself from the second to fourth day after birth. When resulting from soiled linen, etc., it is usually later in presenting its appearance, and, when beginning later than the first week, is almost certainly due to some extraneous source of inoculation. The symptoms are those just described under purulent conjunctivitis, and are generally less severe than under gonorrhœal. The prognosis is therefore more favorable, because with less swelling there is less danger of corneal ulceration.

Statistics have shown that in former years a very large proportion of all cases of blindness have resulted from this disease, in different countries varying all the way from 20 to as high as 79 per cent. In late years the attention that has been paid to the prevention of this disease has very materially lowered the per cent. Still we are daily meeting cases of permanent blindness from this disease which should be attributed wholly to the ignorance of those attending these cases. Much of this fatality could be obviated by careful disinfection of the vagina at the time of parturition and in cleanliness in the linen and the sponges used and the hands of those coming in contact with the child or mother. In *all* cases of gonorrhœal or leucorrhœal discharge in the mother, the method recommended by Credé should *always* be employed. This consists in carefully cleansing the child's eyes with clean water and then the instillation between the eyelids of a drop of the 2 per cent. solution, gr. x. ad ʒi of nitrate of silver. This method is practiced by many obstetricians in all cases, and since its general adoption the percentage of cases of blindness from ophthalmia neonatorum have been greatly reduced.

**Conjunctivitis Gonorrhœica.**—This disease is always due to infection. Its onset is often accompanied by a severe arthritis. The inflammatory process is usually very intense and runs a rapid course. The lids are greatly swollen, as is also the palpebral conjunctiva. There is excessive chemosis and purulent secretion.

The disease usually develops in about forty-eight hours; it may occur in either acute or chronic gonorrhœa, and the more active the gonorrhœa is, at the time of infection, the more severe will be the inflammation. The virus of gonorrhœa may also cause diphtheritic conjunctivitis.

The right eye is more often first affected, and it is more frequently found in males than in females. The physician must always handle all cases of purulent conjunctivitis with extreme care, on account of possible infection. This variety of purulent conjunctivitis is more severe than when due to any other cause, as about one-half of all eyes attacked with this disease are lost, while hardly one-third of the other forms of purulent conjunctivitis are fatal.

*TREATMENT of Conjunctivitis Purulenta.*—If the attack is very severe, the patient may be confined to a darkened room, or even to bed; if only one eye is affected, the other should be hermetically closed in order to prevent any of the matter coming in contact with that eye, for this discharge is very contagious, especially in the gonorrhœal form, and in that found in new-born children. The healthy eye is best protected by means of a watch-crystal held in place over the eye by strips of adhesive plaster. In this way the eye is hermetically sealed; the patient can use the eye for necessary vision, and it is always under the observation of the surgeon. The examination of the cornea to see if ulceration is present is always essential, but great care must be taken to make no pressure upon the eye in opening it, on account of the danger, if ulceration should be present, of causing rupture of the cornea and escape of the lens. There is also danger of some of the purulent secretion spurting into the eye of the surgeon. Owing to the contagiousness of the secretions great care should be exercised both by the nurse and physician, to protect their own eyes and those of others, by providing that the sponges, towels, etc., are used only by the patient; also, that their hands are thoroughly cleansed before touching another eye, for often the physician and other patients have been inoculated and vision destroyed through carelessness on this point. If, by accident, any of the discharge should have entered a healthy eye, lukewarm water should be at once injected under the lids to wash it away; after which, drop in a strong solution of chlorine water, or a weak

solution of nitrate of silver (gr. ij. ad ʒj). Fresh air and nourishing diet are important aids. But the special and primary point to be attended to in the treatment is *cleanliness*. To ensure this, the discharges should be often removed by dropping warm water into the inner canthus until all the pus has been washed away, or by cleansing with the palpebral syringe. This should be done at intervals of from fifteen minutes to an hour during the day, and occasionally through the night, according to the severity of the case. The use of peroxide of hydrogen is of great aid in the thorough cleansing of the eye, so essential in purulent affections.

In the inflammatory stage of purulent conjunctivitis, *ice compresses* will usually be found most valuable, often serving to abort an attack. Ice bags may be used on the eye, or when the weight of the ice bag is complained of, cold may be applied by means of four or five thicknesses of old linen, cut about three inches square and laid upon a large cake of ice; these pads are to be conveyed quickly from the ice to the eye and changed every one or two minutes so that the cold will be constant. Carbolic acid, a 1 to 200 solution, or other disinfectants, can be used in combination with the ice, by having a large piece of ice in a large vessel of the solution.

Caustics are directly efficacious by the irritation of the vascular walls, and indirectly by the contraction that follows a considerable discharge of serum, such as accompanies the shedding of the eschar. A 2 per cent. solution of the nitrate of silver applied once or twice a day is preferable to stronger solutions. The use of Chlorine water, Boracic acid and the like is frequently of great service. Astringents, especially a weak solution of nitrate of silver (2 to 5 grains to the ounce) may be required. If the patient is seen shortly after inoculation with gonorrhœal virus, it may be aborted by one application to the everted lid of a strong solution of nitrate of silver (gr. xxx. ad ʒj), washing it off with water. Scarification is sometimes needed. The incisions are not to be made deep, but long and parallel to each other, and may be repeated every twenty-four hours, if needed; promote the bleeding by warm water and by kneading the lid.

Aqua chlorinii, as an external application, has proved a very valuable remedy in the various forms of *purulent* ophthalmia. Cases have been relieved by it when used alone, as well as with



the indicated remedy. The strong solution is sometimes employed, though we usually dilute it one-half, one-third, or still weaker.

When the cornea becomes ulcerated, some operative measure, paracentesis, or Sæmisch's incision or the use of Atropine or Eserine, may be required, according to the complication. Canthoplasty may be necessary if the lids are much swollen and very tense to relieve the pressure upon the eyeball and to permit of more thorough opening of the lids for the purpose of cleansing the eye.

The most important remedies in this disease are Argent. nit., Hepar, Mercurius, Rhus tox., Calc. hypophos., Acon., Apis, Cham., Euphras., Nitric ac., Pulsat., Sulphur. For indications see *Remedies in Conjunctivitis*, page 214.

**Conjunctivitis Diphtheritica** is perhaps one of the worst diseases of the eye we have to deal with. It is a purulent inflammation, that spreads by infection and the secretion of which is contagious. It may exist alone or with diphtheria of the throat.

**PATHOLOGY.**—It is a fibrinous infiltration throughout the entire thickness of the mucous membrane which seriously interferes with the circulation.

**SYMPTOMS.**—It commences with acute pain (due to strangulation of the nerves and vessels by the infiltration), a feeling of heat and lachrymation. The upper lid becomes very much swollen and sometimes of such a board-like hardness that it is impossible to evert it. The skin of the lid is smooth, shining and of a pale, rosy or livid hue. The upper lid falls down, overlapping the lower, and it is impossible for the patient to raise it. The conjunctiva becomes congested and chemosed, due to an infiltration of coagulated fibrin. There is a dryness of the eye, and on everting the upper lid we find it smooth and yellowish; upon removing a portion of the thickened membrane we find that it has the same appearance all through, due to the infiltration. Owing to a constriction of the blood-vessels, a deep incision will produce no bleeding. The whole lid has a lardaceous appearance in the most severe cases, while in the cases of partial diphtheria we will notice one or two smooth, depressed places of a grayish-yellow color where the exudate is excessive. The conjunctiva between these islands is swollen, red and bleeds easily. Occasionally diphtheritic patches are found on the external angles of the lids.

The secretion is sanious and contains flakes of diphtheritic matter.

The disease so far has been one of infiltration, lasting from one to ten days, and is the most dangerous stage, on account of corneal complications. Then begins the second stage, that of purulent discharge. The lids lose their hardness and there is set up a copious discharge of fibrinous masses. The vessels reappear at points and the infiltration looks like white patches here and there. The chemosis loses its yellow appearance and stiffness, and the whole disease now looks like an ordinary attack of purulent conjunctivitis. Instead of ending here, it enters a stage of cicatrization, in which there is a slough of the gangrenous portions of the conjunctiva, followed by a granulating surface covered by a new epithelial layer, which, extending from the neighboring conjunctiva, causes a drawing in or contraction of that membrane that results in more or less adhesions between the lid and eyeball, and in some cases ends in xerophthalmia.

The great danger in this disease is the liability of corneal complications, due to the infiltration of the conjunctiva shutting off the nutrition of the cornea.

**CAUSES.**—Contagion is the principal cause, yet the disease must be looked upon as an expression of the general condition, for we find diphtheritic affections of other parts at the same time and we may have the general symptoms of fever, exacerbations, weakness, loss of appetite, etc. The good eye, though protected, will often become affected. It is most frequently found from the second to the eighth years of life, and is rarely seen in adults.

**PROGNOSIS** depends upon the amount of infiltration, grayish chemosis and stiffness of the lids. It is always serious and as a rule, more serious in adults than in children. The earlier the cornea is affected the more serious is the prognosis. There is not only the probability of the loss of vision, but in addition the danger of the loss of life. Cases caused by direct contagion are always much more serious.

**TREATMENT.**—See *Conjunctivitis Crouposa*.

**Conjunctivitis Crouposa** (*Conjunctivitis Membranacea*).—This disease is characterized by an exudate on the surface of the tissue where it hardens into a membrane, while in diphtheria the exudate is within the tissue itself. In this disease there is the form-

ation of a membrane, which may be thrown off as a cast of the sac. The membrane may be peeled off and leaves a bleeding surface underneath, while in diphtheria the membrane cannot be peeled off. The swelling and injection is less than that of purulent ophthalmia. The membrane has an especial affinity for the cul-de-sac, while the tarsus and globe are least affected. The lids, while red and swollen, are soft. The upper lid hangs down over the lower. There is at first a watery secretion mixed with mucus which later becomes more purulent. The membrane is similar microscopically to that of tracheal croup. The disease is always acute, and the formation of a fibrinous layer is the essential feature, which is cast off with a slight purulent discharge and cure rapidly follows. It occurs particularly in the spring and autumn, when there is apt to be an epidemic form of diphtheria, and is found especially among children.

TREATMENT.—Although these two forms of inflammation are wholly distinct from each other, they will be considered under the same section, as the treatment is not dissimilar in many points. If only one eye is involved, endeavor to prevent the extension of the disease to the other eye by hermetically closing it, for the discharge is very contagious, though extension may take place through the general dyscrasia. *Cleanliness* is of the greatest importance, as in purulent conjunctivitis. It is better not to exercise any force in removing the false membrane, as it only leaves a raw surface, upon which a new membrane forms, thus doing more harm than good; though all loose shreds should be carefully removed whenever the eyes are washed.

The application of caustic or strong astringents, especially in diphtheritic conjunctivitis, *is always injurious* except in the purulent stage, and then must be used very guardedly. Hot applications are better than cold, which serve to still further constrict the blood-vessels, and may be used especially in the purulent stage. A solution of alcohol and water (3j ad 3ij) has been employed locally with some benefit in diphtheritic inflammation; also a one per cent. solution of Carbolic acid. Solutions of both lactic and acetic acid have been used locally with benefit. Lemon juice brushed over the surface of the conjunctiva every six hours is highly recommended by a number of physicians. In croupous inflammation chlorine water has been useful as an external appli-

cation. Corneal complications require especial attention. In the cicatricial stage palliate the desiccation of the eye by instillations of milk, boroglycerine, or the carbonate of soda, gr. xxx. ad ʒi.

The most serviceable remedies are Acetic acid, Kali bich., Apis, Merc. prot., Argent. nit., Arsen., Hepar, Lachesis, Phytolacca, etc. See *Remedies in Conjunctivitis*, page 214.

**Conjunctivitis Follicularis** is very frequently found and presents a very similar appearance to that met in trachoma, and is often mistaken for it.

**PATHOLOGY.**—It is a simple hypertrophy of the lymph follicles, which microscopically are found to have a delicate reticular connective tissue, in the meshes of which are found lymph corpuscles and free nuclei, and are also permeated by fine capillaries.

**SYMPTOMS.**—The conjunctiva appears filled with small, round, pinkish prominences, occupying the cul-de-sacs especially of the lower lid, where they are first noticed and always more prominent. In advanced cases they are arranged in rows, running parallel with the margin of the lid, and later may involve the superior cul-de-sac and the angles of the tarsus. Occasionally they may be found on the tarsus, where they appear as small, whitish, slightly raised patches. (See Chromo-Lithograph, Plate 1, Fig. 3.)

The condition comes on slowly and lasts for months or years. It is unaccompanied by any discharge except in the acute cases when it simulates a catarrhal conjunctivitis, and has but slight photophobia, with occasional painful sensations, but no marked symptoms.

**CAUSES.**—Usually results from bad hygienic surroundings and is often endemic in schools, asylums and prisons. The use of atropine in some cases will cause it. This disease is often complicated by a catarrhal conjunctivitis when we have the symptoms of irritation, discharge, etc. The disease is mostly met with in children and appears to be contagious. Follicular conjunctivitis never leads to subsequent shrinking and cicatrization.

**TREATMENT.**—Fresh air, change of climate and proper hygienic surroundings are a great aid to the cure of the trouble. Local applications, such as those used in trachoma, have not proved of much benefit, although mild astringents will in some



cases be of help. Correct any errors of refraction that may be present. Pressing out the contents of the follicles between the thumb nails, or by Knapp's roller forceps, as described under trachoma, will cure the disease in a much shorter time than under any other method of treatment. We have seen a number of cases of follicular conjunctivitis promptly and quickly cured by the use of Knapp's forceps, with little or no reaction, and we believe this operation is the best treatment at present known for aggravated cases of this disease. The use of electricity is also of much value; but, as each follicle has to be punctured with the needle, the treatment is necessarily very tedious.

The local use of corrosive sublimate as described under *trachoma* is of much service in this disease.

The internal administration of *Natrum mur.*, *Euphras.*, and *Sepia* has cured some of these cases. See *Remedies in Conjunctivitis*, page 214.

**Conjunctivitis Trachomatosa.**—(*Granular Lids, Trachoma, Egyptian Ophthalmia.*) Is an infectious inflammation of the conjunctiva, that is characterized by its chronic course and hypertrophy of the conjunctiva with a purulent infectious secretion. This disease has received numerous sub-divisions and classifications, we prefer that of *granular* and *papillary*. The great majority of cases, however, are of the mixed variety and so distributed that the most prominent feature over the lids is the papillary proliferation, while the trachoma granules are more characteristic toward the cul-de-sacs.

**PATHOLOGY.**—This has been the subject of much dispute and still does not seem to be definitely settled. Some claim it to be a circumscribed hyperplasia of the lymphatics normally found in the reticulated connective tissue of the conjunctiva, thus-forming true lymphoid follicles; while others claim they are new growths. They consist of small rounded masses made up of lymphoid and connective tissue cells, surrounded by a fibrous capsule and traversed by blood-vessels and connective tissue fibres. Swanzy\* says: "The trachoma bodies have no capsule as have the follicles, but seem to grow from or in the stroma of the conjunctiva. They are to be regarded as new growths in the conjunctiva." The granule may undergo fatty degeneration and its contents be

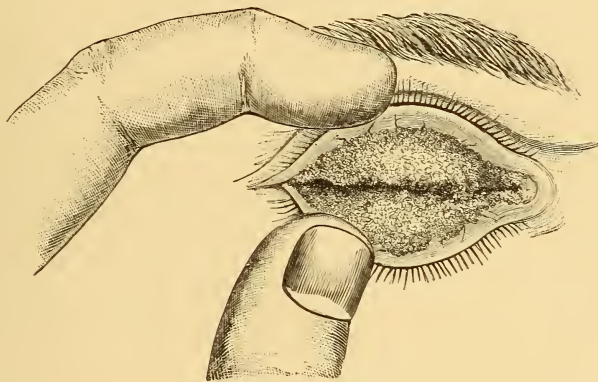
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\* Diseases of the Eye, 1897, p. 112.

pressed out, or the connective tissue of the granule may increase and, from ultimate contraction, result in entropium. De Wecker\* says: "A granulation lives and dies feeding on the parent that gave it life—it consumes the conjunctiva." Hence it is a malignant product, while follicles or purulent conjunctivitis are essentially benign.

**SYMPTOMS.**—They appear as yellow or reddish-gray translucent, roundish elevations, looking like frog-spawn (Fig. 58), and are generally found in the retro-tarsal folds and at the angle of the lids in the earliest stages. When occurring in the conjunctiva over the tarsus they are smaller and less visible because the membrane is so closely adherent to the tarsus. In this situation they

FIG. 58.



Everted granular lids.

appear as small bright-yellowish points deeply imbedded in the membrane. As the disease advances they extend in the worst cases, over the ocular conjunctiva and even upon the cornea. They are oval in shape and broader and less prominent than the hypertrophied follicles. (See Chromo-Lithograph, Plate I, Fig. 4.) There is some drooping and swelling of the lids and a slight secretion of a purulent character, causing some agglutination of the lids in the morning. The irritation of the eye and the quantity of the discharge is much increased in fresh cases or in acute aggravations of old cases. Pain, photophobia and lachrymation may be present and, during acute aggravations, become very severe.

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\* Ocular Therapeutics.

COURSE.—The disease is usually very insidious in its course. As it progresses the granulations increase in size and become covered with fine capillaries, the conjunctiva becomes red and infiltrated and secretes a muco-purulent discharge, the papillæ swell, increase in size and blend with the granules. We have then the conjunctiva appearing as a fleshy mass, in which we are no longer able to distinguish the individual granules or papillæ. Then a retrograde process sets in, and terminates in a cicatricial state with contraction of the conjunctiva. The formation of cicatrices is shown first by narrow whitish striæ in the red thickened conjunctiva. These striæ unite to form a delicate network. These lines grow broader, the islands they enclose smaller until the whole conjunctiva becomes pale, thin and smooth. Sometimes the neoplasm appears as polypoid excrescences or condylomatous masses.

CAUSES.—Trachoma is the result of infection from the secretions of an infected eye by some direct transfer, and is probably due to some *micrococcus*. In the majority of cases trachoma requires months or years to run its course. Trachoma may appear at all ages, except in the very young. It may be either acute or chronic, and we may have acute exacerbations of an existing chronic trachoma. It is usually met with in places where the population is over crowded, ill-fed and amid unfavorable hygienic surroundings. Negroes in this country seem to enjoy great immunity from trachoma. True trachoma is very rarely seen among the better classes, but is often endemic in public institutions, asylums, etc.

COMPLICATIONS.—The conjunctiva in long existing cases, undergoes fibroid degeneration, atrophies and appears as grayish white cicatricial bands, usually running parallel with the border of the lid. The most frequent sequelæ of trachoma is the distortion of the lid due to the cicatricial contraction and resulting in *trichiasis* and *entropium*. *Symblepharon* may also result from the same cause. There may be also more or less dryness and shrivelling up of the conjunctiva, which sometimes goes on to complete destruction of the conjunctiva—*xerosis*. The roughened condition of the conjunctiva causes a superficial vascularity of the cornea, with a proliferation of the epithelial cells between the epithelium and Bowman's membrane, resulting in an opacity of the cornea called *pannus*. Later the whole cornea may become

softened, lose it resistance, yield to the intra-ocular pressure and bulge. Occasionally the granules extend and may even be found in the cornea. Ulcers and abscesses of the cornea or a catarrhal or purulent conjunctivitis are very frequently found associated with trachoma.

PROGNOSIS.—In the early stages, when under careful treatment, resolution may occur in a short time. Later, however, the disease is more stubborn, its duration almost unlimited and it leaves changes in the lid or cornea which may produce more or less serious disturbance of vision and even blindness.

#### DIFFERENTIAL DIAGNOSIS.

Conjunctivitis Trachomatosa.	Papillary Trachoma.	Conjunctivitis Follicularis.
Affects especially the upper lid — particularly the retro-tarsal fold. The granule is oval, reddish-gray and more or less opaque; it is imbedded in the membrane, and is less prominent than the follicles, and it may be found on the ocular conjunctiva and even the cornea. In the granular variety, the affection, as a rule, soon takes on the mixed form, characterized by the presence of follicular and papillary hypertrophy in addition to the neoplasm. There is also general lymphoid infiltration of the conjunctiva and of the deeper tissues of the lid, including the tarsus, great proliferation of the epithelium and the formation of new vessels. Frequently accompanied by pannus. Very seldom met with in children. Always leaves a cicatricial membrane.	Its location is predominantly over the surface of the tarsus instead of its borders. The enlarged papillæ are of a bright red or bluish-red color which gives the lid a velvety, injected appearance. Is more rapid in its onset.	Affects especially the lower lid, particularly the cul-de-sacs. The follicle is round or elongated, pale and semi-transparent; it is more prominent and sharply raised above the surface of the conjunctiva, and can be removed or separated from it. Its general arrangement is in rows parallel to the free margin of the lid. Never causes pannus. Found especially in children. Entirely recovers; leaves no cicatricial membrane.



**Papillary Trachoma**, as described by some, is a hyperæmia, inflammation and hypertrophy of the normal papillæ of the conjunctiva. Their elevations are mostly found on the surface of the conjunctiva over the tarsus, which gives to it a velvety appearance, and is always most pronounced upon the upper lid. There is also a proliferation of the epithelium. This gives the conjunctiva at first a red, roughened appearance, and later that of a swollen, bright red mass, studded with elevations. If uncomplicated, the inflammatory product may be absorbed and the conjunctiva restored to its normal condition.

**TREATMENT.**—As these forms of conjunctivitis are usually found among the lower classes or those who are constantly exposed to wind and dust, care should be taken that these exciting causes be removed as far as possible; cleanliness and proper hygienic measures are very important aids in the treatment of this affection.

It should be remembered that the discharges from granular lids are contagious, and that whole families or a whole school may be inoculated from one member by an indiscriminate use of towels, etc.; therefore, strict attention should be paid to the prevention of its extension. All trachoma patients should have their own washing materials, linen, bed, etc., and in schools, institutions, etc., the cases should be isolated from the other inmates.

If a cure can be effected by internal medication it seems to be more permanent than if total reliance is placed upon local applications, but I do not hesitate to use local remedies if there is no particular indication for any special drug, or if the case proves very obstinate. In acute trachoma or acute aggravations of chronic granular lids, *ice compresses* will prove very agreeable to the patient and aid materially in controlling the intensity of the inflammatory process. In chronic granular inflammation of the conjunctiva, especially when complicated with pannus, which is usually present, local treatment will be found of the greatest service. The following topical applications have been followed by more favorable results in my hands than any others:

℞. Acidi Carbolici, . . . . .	gtt	vj
Glycerini, . . . . .		ʒj
Misce.		
℞. Acidi Tannici, . . . . .	gr.	xv
Glycerini, . . . . .		ʒj
Misce.		

They should be applied with a camel's hair brush to the everted lids once a day. Other applications which have also proved beneficial in individual cases are alum, used as a powder, in a saturated solution with glycerine and in the crude stick; cuprum aluminatum and sulphuricum used in crystals; nitrate of silver in a weak solution (gr. ij—x ad 3), and bichromate of potash in a saturated solution.

The local use of corrosive sublimate in solutions of varying strengths, from 1 to 1000 to 1 to 200, gives extremely satisfactory results in many cases. It may be used by simply rubbing the lids energetically with a hard wad of absorbent cotton moistened in the solution, or by making slight scarifications with the Johnson grattage-knife (Fig. 59) and then applying the solution. Under

FIG. 59.



Johnson's grattage knife.

the use of cocaine there is but little if any pain, and but slight inflammatory reaction occurs except possibly from the stronger solutions. The scrubbing of the lids with the bi-chloride solutions should be followed up two or three times a week, and if followed up yields the best results of any treatment we know of. A number of operative measures have been suggested from time to time which have been credited with more or less success by different authorities. We shall, however, refer to but one operation in detail which, in our experience, seems to be the most satisfactory, and that is the

FIG. 60.



Knapp's roller forceps.

following, which may be called *the operation of expression of the morbid substance with a roller-forceps*, and is described by Knapp.\* He uses the roller-forceps (Fig. 60) made by having two steel

\*Archiv. Ophthalm., vol xxi., 1, 1892.

cylinders so inserted into the forked end of a small but strong pair of forceps that they roll upon each other.

As the operation is rather long and more or less painful, a general anæsthesia should be employed. The lower lid is everted and may be superficially scarified with the Johnson knife, although scarification is by no means indispensable. One roller of the forceps is then pushed deeply into the fornix, and the other applied to the anterior portion of the everted lid, the forceps are then compressed and drawn forward, so that the tissue between the cylinders is milked out. The instrument is reinserted and the neighboring portion treated in the same way. This manipulation is repeated until the cylinders roll easily and evenly over the evacuated conjunctiva. The upper lid is then treated in the same way. To reach the superior cul-de-sac, the tarsus may be drawn away from the eye with fixation forceps. Especial care should be taken to reach all parts of the conjunctiva at the fornix and commissures. The forceps should be frequently dipped into an antiseptic fluid in order to be kept clean and free from coagulated blood, which prevents the rollers from turning. Both lids of both eyes may be treated at the one operation, and but one operation is usually required. But slight reaction usually occurs, and the patient is not necessarily, though preferably, kept confined. The application of the corrosive sublimate solution, 1 to 1,000, or weaker, may be used immediately after the operation, if desired.

This method is of the greatest value in follicular conjunctivitis and in the cases of densely packed spawn-like granulations. When thoroughly done the conjunctiva is left perfectly smooth and assumes its normal appearance in from one to two months.

*Excision of the retro-tarsal fold*, as advised by Jacobson, has been extensively practiced. Treitel\* reported its trial in 170 cases with satisfactory results. It has at the same time been praised and condemned by many other authorities. From our own observation it has not given as favorable results by far as the operation detailed above.

The once much-lauded Jequirity treatment seems now to be a thing of the past.

At the same time local treatment is employed the carefully selected internal remedy (see page 214) should be administered.

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\* Therap. Monatshefte., 1889, 2 and 3.

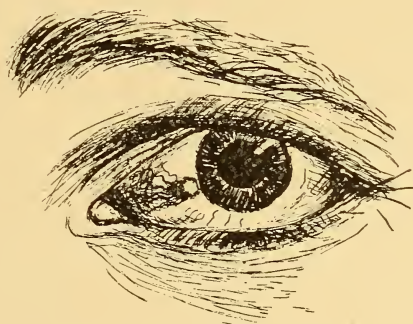
The selection will usually be from the following list: Acon., Aurum., Mercurius, Rhus tox., Pulsat., Sulph., Nux vom., Argent. nit., Kali bich., Alumen, Alumina, Arsen., Bell., Calcarea carb., Chininum mur., Cuprum, Euphras., Natrum mur., Thuja.

**Conjunctivitis Phlyctenularis.** — (*Pustular, Scrofulous, Strumous and Herpetic Conjunctivitis.*)

**PATHOLOGY.**—Consists of a collection of lymphoid cells just beneath the epithelium raising it up. The apex breaks down, leaving a minute ulcer.

**SYMPTOMS AND COURSE.**—In the most simple form we find on the ocular conjunctiva a slight triangular-shaped injection, at the apex of which there is a small reddish eminence. There is generally several of these, which may become absorbed, leaving no trace behind them; but usually the epithelial covering breaks down, forming an ulcer at the apex of the cone, which gradually sinks to the level of the conjunctiva and then quickly heals. The smaller the nodules the greater the number as a rule, and the small ones disappear by absorption. Again we may find a very pronounced redness with the formation of a very large phlyctenule

FIG. 61.



Conjunctivitis phlyctenularis.

at the border of the cornea itself. (Fig. 61.) There may be several of these at a time or they may form successively. They break down and form large ulcerations that may be some weeks in healing, or they may perforate and cause staphyloma. Sometimes this form may be accompanied by a yellowish infiltration or abscess of the cornea. Finally, very large phlyctnules may form



on the ocular conjunctiva; the inflammation extends, grows deeper and involves the sclera. They often ulcerate, but usually only affect the superficial layers of the sclerotic and are of long duration.

There are sometimes no subjective symptoms, but usually excessive lachrymation, violent pain, intense photophobia and blepharospasm. Frequently the child will lay with the eyes closed and the face buried in the pillow all day long. There is always a great tendency to relapses.

The disease will usually run its course in from eight to fourteen days, but, as relapses or successive crops are particularly liable to occur, the eye may not be entirely free from the trouble at any time for months or even years. The parents should always be warned that the child is liable to have recurrent attacks for years, often continuing until and ceasing with puberty. The *prognosis* is always favorable so far as the cure of individual attacks, the only danger being that subsequent attacks may involve the cornea and, leaving a macula over the pupil, affect in this way the vision.

CAUSES.—Especially apt to occur in children and may be found in the perfectly healthy child as well as the weak and delicate ones. It is, however, most frequently seen in children of a scrofulous diathesis. Any irritating influence may cause it, such as errors in refraction, etc. It is again frequently observed associated with or following the exanthematous diseases. Bissell\* calls attention

#### DIFFERENTIAL DIAGNOSIS.

Conjunctivitis Phlyctenularis.	Conjunctivitis Catarrhalis.	Episcleritis.
One or more small nodules usually at the corneal border. The phlyctenule forms the apex of a triangular-shaped congestion, the vessels running to the nodule. The vessels are more superficial and movable on pressure. No discharge. Runs a rapid course and heals by ulceration.	Has no localized elevations. The inflammation is general and of the conjunctival vessels alone. Discharge is more or less profuse.	The elevation has a very much larger base, its color is darker and shows no tendency to ulcerate. The congestion is much deeper, more of a bluish tint, and overlaying the scleral vessels are seen the conjunctival vessels, which by pressure are made to move over the swelling. Little or no discharge. Course very chronic.

\*The Homœopathic Eye, Ear and Throat Journal, Vol. II, p. 10, 1896.

to intra-nasal conditions as playing a very important factor in the causation of this trouble.

**TREATMENT.**—It has been thought best to include under this head the various forms of phlyctenular inflammation of the eye, whether affecting the cornea or conjunctiva, as the ætiology, symptomatology, course and treatment vary little in either case; in fact, those remedies which have been found useful when the cornea is invaded are also our chief reliance in this form of inflammation of the conjunctiva.

The first points to be attended to are cleanliness and careful regulation of the diet. It is our rule to always prohibit all sweets and fats from the diet and confining the child mainly to milk, eggs, beef, mutton, etc. The eyes should be bathed often in lukewarm water, and any little scabs which may have formed on the lids immediately removed, as they only prove a source of irritation. If there is considerable photophobia, and the child is rubbing the eyes constantly, a compress bandage will prevent this, and at the same time, by keeping the lids closed, will relieve the irritation to the eyeball occasioned by their constant opening and closing; it also excludes the light, relieving the photophobia, soaks up the tears and so prevents their running over the cheek, making it sore and excoriated. The bandage is very seldom required, but when it is, should be removed every four or five hours and the eyes cleansed. External applications should not, as a rule, be employed, as we can usually cure better and quicker with internal remedies alone, if we are careful in the selection of our drugs. Occasionally, however, a case will be found which has proved very obstinate to treatment, where the ciliary injection is great, photophobia intense, and pupil a little sluggish—in which a weak solution of *Atropine* dropped into the eye once or twice a day will be of great benefit. In some slow, indolent cases, the use of the following to stimulate into a more active condition is of value:

℞. Hydrarg. oxid. flav., . . . . . gr. iv  
 Vaseline, . . . . . ʒj  
 Misce.

Of this, a very small piece, not larger than the head of a pin, may be placed within the eye once or twice a day.

The most frequently indicated remedies are Pulsat., Sulphur, Hepar, Ipecac., Graph., Calc. carb., Calc. iod., Cham., Conium, Mercurius, Arsen., Rhus tox., Euphras., Antimon. crud., Aurum, Kali bich., Nux vom., Sepia, Apis, Baryta, Natrum mur., Psorinum. See *Remedies in Conjunctivitis*.

### Remedies in Conjunctivitis.

**Acetic acid.**—A remedy of the first importance in *croupous* conjunctivitis in which the *false membrane is dense, yellow-white, tough, and so closely adherent* that removal is almost impossible. The lids are œdematously swollen and red. Although the membrane is closely adherent, it is not *in* the tissue, and so does not correspond to diphtheritic conjunctivitis.

**Aconite.**—Is especially indicated in the *first stage* of any inflammation of the conjunctiva when the eyes are *red, burning, very painful* and *with great dryness*. The conjunctiva is intensely hyperæmic, may be œdematous and even chemosed. The eyes are usually dry, but may be useful when there is a moderate lachrymation and a muco-purulent discharge. The pain is generally described as smarting, *burning*, with sensitiveness to the air, but there is often an aching or bruised pain, with the feeling as if the eyeball was enlarged and protruding, making the lids tense. Especially useful in an *inflammation from a foreign body, in acute catarrhal or an acute aggravation of granular lids and pannus*, particularly when induced by overheating, violent exercise, or by exposure to dry, cold air. It is in the Aconite cases that ice is especially serviceable.

**Allium cepa.**—Of use in *acute catarrhal* conjunctivitis associated with a similar condition of the air passages, as in hay fever; the lachrymation is scalding, profuse and not excoriating, though the nasal discharge is so (reverse of Euphrasia).

**Alumina.**—In chronic *granular lids* where there is much marked dryness of the lids and eyes, especially in the evening, with burning, itching and pressure always aggravated from over-use of the eyes, and accompanied by a sensation of dryness, with a moderate discharge and a heavy feeling in the lids.

**Antimonium crud.**—In *phlyctenular or pustular* conjunctivitis, especially in cross children who are afflicted with pustules on the face and moist eruptions behind the ears. The lids are red,

swollen and excoriated by the profuse mucous discharges and lachrymation. Excoriation of the nostrils and swollen upper lip. (Similar to Graphites.)

**Apis mel.**—May be indicated in any form of conjunctivitis if there is *great swelling* (*œdematous*) *of the lids and adjacent cellular tissue*. The conjunctiva is congested and of a dark, red, puffy condition. The discharge is moderate, while the lachrymation is profuse, hot and burning, with photophobia (*Rhus*). The tears while hot and burning do not excoriate the lids, as in cases in which *Arsenicum* is indicated. The character of the pains, which are *stinging and shooting*, is an important indication, and serve to distinguish between *Apis* and *Rhus* cases which objectively are very similar. The symptoms are aggravated in the evening and often concomitant symptoms, such as drowsiness, absence of thirst, and dropsy, are present.

**Argentum nit.**—This is the most serviceable remedy in the whole materia medica for any form of *purulent* inflammation of the conjunctiva. The most intense chemosis with strangulated vessels, profuse purulent discharge and commencing haziness of the cornea, with a tendency to slough, have been seen to subside rapidly under this remedy. The absence of subjective symptoms, with the profuse purulent discharge, and the swollen lids, swollen from being distended by a collection of pus in the eye, or from swelling of the sub-conjunctival tissues, and not from infiltration of the connective tissues of the lids themselves (as in *Rhus* or *Apis*), indicates the drug. In the blenorrhœal stages of conjunctivitis when the discharge becomes profuse and assumes a purulent character. In some chronic forms of conjunctivitis when the conjunctiva is scarlet-red and the papillæ hypertrophied. The inflammatory symptoms usually subside in the open air and are aggravated in a warm room. In the early stages of *acute granular* conjunctivitis, if the conjunctiva is intensely pink or scarlet-red and the discharge is profuse. The use of a solution of five or ten grains of the first decimal trituration to two drachms of water, as a local application, after the very profuse discharge has subsided, is often of very great value.

**Arsenicum.**—Especially of service in *phlyctenular* conjunctivitis after the pustules have broken leaving a superficial ulceration. Also in *acute catarrhal* conjunctivitis with chemosis, much hot,



scalding lachrymation, *burning pains, especially at night*, and an œdematous condition of the lids, particularly the lower. Indicated in *chronic granular* lids, when the palpebral conjunctiva only is inflamed; the lids are painful, dry, and rub against the ball; they burn and can scarcely be opened. In *chronic* forms if the *lachrymation and discharges are thin and acrid* excoriating the lids and cheek. The photophobia is usually intense, and often relieved in the open air. The lids may be œdematous and spasmodically closed, or else inflamed and excoriated by the acrid discharges. The nostrils and upper lip are usually excoriated by the acrid coryza. It is especially indicated in low, cachectic conditions, and the ill-nourished, scrofulous children of the poor. Great restlessness and thirst for small quantities of water are commonly noticed. Warm applications generally relieve. The attacks of inflammation are frequently periodic and often alternate from one eye to the other.

**Aurum met.** — *Scrofulous ophthalmia*, with ulceration and vascularity of the cornea. Useful in *trachoma*, either with or without pannus (especially when pannus is present); there is probably no other remedy given internally alone that has cured more cases. Photophobia severe, lachrymation profuse and scalding; eyes very sensitive to touch. The pains are from without inward, and worse upon touch (reverse of *Asafoetida*). The cervical glands are usually swollen; patient very irritable and sensitive to noise.

The *muriate of gold* is frequently employed, though the symptoms, as far as known, vary but slightly from those of the metal.

**Baryta iod.** — In *scrofulous ophthalmia* when enlarged cervical glands are present.

**Belladonna.** — In the early stages of *catarrhal* conjunctivitis, if there is great dryness of the eyes, with a sense of dryness and stiffness in the thickened red lids and smarting, burning pain in the eyes. Photophobia is marked. Concomitant symptoms of headache, red face, etc.

**Calcarea carb.** — Particularly indicated in *phlyctenular keratitis* and conjunctivitis and in some cases of *trachoma*, when due to exposure to wet. There is usually excessive photophobia and lachrymation (often acrid). The lids may be red, swollen and agglutinated in the morning. The eye symptoms are *aggravated*

during damp weather, or from the least cold, to which the patient is very sensitive. In *fat, unhealthy, strumous children* with enlarged glands, distended abdomen, pale flabby skin, eruptions on the head and body which burn and itch, and cold sweat of the head. Occasionally useful in *catarrhal* conjunctivitis caused by working in water. Usually prescribed upon the concomitant symptoms. As the discharges are often profuse, it has been used with advantage in *purulent* ophthalmia, especially *neonatorum*, characterized by a profuse yellowish-white discharge, œdema of the lids and ulceration of the cornea.

**Calcarea iod.**—Indications are similar to *Calcarea carb.*, but especially in cases where we have considerable swelling of the tonsils and cervical glands.

**Calcarea hypophos.**—*Purulent* conjunctivitis, with ulceration of the cornea, occurring in patients who are very much debilitated, and who have little vitality. In one case of gonorrhœal ophthalmia treated by Dr. George S. Norton,\* where there was a moderate discharge and no pain, but with excessive chemosis, tendency to perforation at periphery of the cornea, and, in fact, the whole cornea seemed to be sloughing, Eserine 1 to 200 was instilled, and *Calcarea hypophos.* given with immediate and remarkable improvement of the whole condition.

**Chamomilla.**—*Scrofulous* ophthalmia in *cross, peevish children* during dentition and will often relieve the severity of the symptoms, even though it does not complete the cure. In ophthalmia *neonatorum* is often of service as an intercurrent remedy, even if does not remove the whole trouble. The cornea is usually invaded, and we have great intolerance of light, considerable redness and lachrymation. Sometimes the conjunctiva is so much congested that blood may ooze out, drop by drop, from between the swollen lids, especially upon any attempt to open them (*Nux*).

**Cinnabaris.**—When the characteristic symptom of *pain above the eye, extending from the internal to the external canthus* (usually above, though sometimes below). The cornea is generally implicated and the symptoms of photophobia, lachrymation, etc., are severe.

**Conium mac.**—In *phlyctenular* inflammation, especially when the cornea is implicated. There is *intense photophobia and profuse*

\* Transactions Hom. Med. Soc. State of New York, 1884.

*lachrymation* upon any attempt to open the spasmodically closed lids. The pains are various, but generally worse at night. With all this intense photophobia there *is very slight or no redness of the conjunctiva.*

**Croton tig.**—In phlyctenular ophthalmia associated with a vesicular eruption on the face and lids; the eyes and face feel hot and burning, especially at night; the photophobia is marked, ciliary injection like iritis often present, and considerable pain in and around the eye, usually worse at night.

**Duboisin.**—*Chronic hyperæmia of the palpebral conjunctiva in hyperopes.*

**Euphrasia.**—In *catarrhal* conjunctivitis, especially acute, when caused by exposure to cold, and in those cases occurring during the first stages of the exanthematous diseases. In *phlyctenular* ophthalmia and *trachoma* when the characteristic objective symptoms are present. *The lachrymation is excessive, acrid and burning. The discharge is profuse, thick, yellow, muco-purulent and acrid, making the lids sore and excoriated.* (The secretion is also excoriating under Arsenic and Mercurius, but thinner.) Intolerance of light is generally present, though not always, and the conjunctiva may be red, even chemosis. Fluent, acrid coryza often accompanies the above symptoms.

**Graphites.**—Is one of our most important remedies in *phlyctenular* conjunctivitis and keratitis in both acute and chronic forms, but perhaps more often the chronic recurrent form. It may also be of service in the chronic *catarrhal* conjunctivitis. It is especially indicated in scrofulous subjects, covered with eczematous eruptions, chiefly on the head and behind the ears, which eruptions are glutinous, fissured and bleed easily. *The photophobia is usually intense and the lachrymation profuse, though in some cases nearly or entirely absent; generally worse in the morning and by daylight than by gaslight. The redness is generally marked and there may be pannus; the discharges are muco-purulent, constant, thin and excoriating. The pains are not important. The lids are red, sore and agglutinated in the morning, or else covered with dry scabs, while the external canthi are cracked and bleed easily upon opening the eye. A thin, acrid discharge from the nose often accompanies the eye symptoms.*

**Hepar sulph.**—Is most useful in the severer forms of *pustular*

inflammation, especially of the cornea and when ulceration has commenced. Also often indicated in *purulent* ophthalmia if ulceration of the cornea is present. *Intense photophobia, lachrymation and great redness of the eye, even chemosis. The lids may be swollen, spasmodically closed, bleeding easily upon any attempt to open them and very sensitive to touch. The discharge is considerable and of a yellowish-white color. The pains, like all the other symptoms, are severe, of a throbbing, stinging character, relieved by warmth and aggravated by cold, and usually worse at night or in the evening. Particularly indicated in scrofulous, outrageously cross children, who have eruptions and boils on various portions of the body. When hypopyon is present with the ulceration, Hepar is especially the remedy. Sometimes employed with benefit in catarrhal and in the blenorrhœal stage of croupous conjunctivitis.*

**Ipecacuanha.**—Is a remedy very frequently serviceable in *phlyctenular* ophthalmia, where there is much *photophobia* and redness of the eye. It has more redness than Conium and less lachrymation than the Rhus patient.

**Ignatia.**—In some cases of *catarrhal* conjunctivitis in nervous, hysterical subjects, sensation as if sand in the eyes with great dryness.

**Kali bichrom.**—Both *croupous* and *diphtheritic* conjunctivitis, and *trachoma* with *pannus* especially indicated when the false membrane is present, if *shreds or strings of it float loose in the eye. The discharge is of a stringy character and mixed with tears. In phlyctenular conjunctivitis, especially chronic indolent cases. Absence of photophobia and redness. Pain and lachrymation are also generally absent. The eye is frequently sensitive to touch.*

**Lachesis.**—*Croupous* conjunctivitis where there is a great tendency to hæmorrhage, especially upon removing any of the membranes.

**Mercurius.**—A frequent remedy for *strumous* ophthalmia, especially when the cornea is involved. In ophthalmia *neonatorum* when the *discharges are thin, excoriating* and caused by syphilitic leucorrhœa. It is also one of our best remedies in *gonorrhœal* or *purulent* conjunctivitis in either acquired or hereditary syphilitic subjects. *The lachrymation is profuse, burning and excoriating, and the muco-purulent discharges are thin and acrid.*



*The pains are generally severe*, tearing, burning, shooting or lancinating, may extend to the forehead and temples, and seem to lie deep in the bones; they *are always aggravated at night*, especially before midnight, by heat, extreme cold and in damp weather, and are temporarily relieved by cold water. The redness and photophobia are generally marked and may be intense, more often *aggravated by any artificial light*, as gaslight or the glare of a fire. The lids are often spasmodically closed, thick, red, swollen, excoriated from the acrid lachrymation and sensitive to heat or cold and to contact. The concomitant symptoms of excoriation of the nose, condition of the tongue, eruption on the face, pain in the bones, etc., etc., are of the first importance in selecting this drug.

**Mercurius corr.**—The pains are more severe, photophobia more marked, lachrymation more profuse and excoriating, and all the symptoms more intense than under any preparation of Mercury we have. Pustules on the cheek, enlarged cervical glands, coated tongue, excoriating coryza, etc., are usually present.

**Mercurius dulc.**—Calomel dusted into the eye has been employed for many years by the old school in *scrofulous ophthalmia*, and even now is considered one of their chief remedies. We also have found this remedy, given internally in the potencies, very useful in the severer forms of this inflammation occurring in pale, flabby, scrofulous subjects. Nose sore and upper lip swollen.

**Mercurius nit.**—One of Dr. Liebold's favorite remedies in *phlyctenular ophthalmia*. In severe cases as well as mild, chronic as well as acute, superficial as well as deep ulcers, all have yielded to its influences; in some cases there has been *much photophobia*, in others none at all, in some severe pain, in others none. It may be used as an external application at the same time; the first potency, ten grains to two drachms of water (or even stronger), dropped into the eye two, three or more times a day.

**Mercurius præc. rub.**—In *trachoma with pannus* it is a valuable remedy, especially in old chronic cases, when the cornea is covered with pannus of a high degree with considerable redness, discharge and photophobia.

**Mercurius prot.**—More commonly called for in *membranous conjunctivitis* than any of the other preparations of Mercury,

and may be indicated in all stages of the disease. The membrane on the conjunctiva and cornea is ulcerated. Cornea more vascular, pains, photophobia and other symptoms of a higher degree than Kali bichr. The nocturnal aggravation and characteristic appearance of the tongue and throat are present. In *phlyctenular* inflammation where there is quite extensive superficial ulceration of the cornea. In conjunctivitis *trachomatosa*, especially if pannus is present, the eye is quite *red and painful, with photophobia* and acrid discharges. *Tongue coated yellow at the base.*

**Mercurius sol.**—Most common preparation indicated in *catarrhal* conjunctivitis. The redness and dread of light are usually well marked, especially in the evening, by artificial light. *The lachrymation is profuse burning and excoriating and the muco-purulent discharges thin and acrid*, making the lids and cheek red and sore. This remedy is very often used in *scrofulous ophthalmia* and the indications correspond very closely in all points to those found under the head of Mercurius.

**Natrum mur.**—The eye symptoms are not particularly characteristic; there may be itching, burning and feeling of sand in the eyes, worse in the morning and forenoon; the pains are not severe, except, perhaps, the sharp pain over the eye upon looking down. The lachrymation is acrid and excoriating, making the lids red and sore; the discharges from the eye are also thin, watery and acrid. The photophobia is usually marked and the lids are spasmodically closed. The skin of the face, around the eyes, is often *glossy and shining*, while throbbing headaches and other concomitant symptoms are generally present. This remedy has proven of especial value in *follicular* conjunctivitis.

**Nitric acid.**—Is especially advised for *gonorrhæal* ophthalmia. Lids much swollen, red, hard and painful, conjunctiva hyperæmic, chemosis, cornea ulcerated, great photophobia and lachrymation, copious discharge of yellow pus which flows down the cheek, pressing and burning pain in the eye, worse at night. The cheeks are also usually much swollen and painful. A very weak solution may be used locally at the same time it is given internally.

**Nux vom.**—May be useful in *phlyctenular* ophthalmia and *trachoma*, especially if the cornea is involved, as the most characteristic indications are *excessive photophobia and morning aggrava-*

*tion of all symptoms.* The lachrymation is usually profuse and the pains vary in character, usually sharp, darting or burning in and around the eye and are always worse in the morning. The pains are sometimes relieved by bathing the eyes in cold water. Gastric symptoms of Nux are often present.

**Phytolacca.**—Should be valuable in *diphtheritic conjunctivitis* with *firm, hard swelling of the lids*.

**Psorinum.**—Is often useful in *chronic cases of recurrent scrofulous ophthalmia*.

**Pulsatilla.**—Is one of our most valuable remedies in *phlyctenular, catarrhal and purulent conjunctivitis*. In phlyctenular particularly when the *pustules are confined to the conjunctiva* and in purulent when the discharge is *bland and profuse*. Many cases of ophthalmia neonatorum have been cured by this drug alone, though it is particularly called for as an intercurrent remedy during the treatment by Argent. nit., for often when the improvement under the latter remedy is at a stand still a few doses of Pulsatilla will materially hasten the progress of the cure. In *trachoma* when the granulations are very fine (papillary trachoma).

It is particularly indicated in persons, especially amenorrhœic females, of a mild temperament and a fair complexion, and is also very suitable in this class of ailments occurring in the negro. The dread of light is moderate or absent and the redness varies. The lachrymation is not acrid, but more abundant in the open air, while the other *discharges are generally profuse, thick, white or yellow and bland*. The pains are most often of a pressing, stinging character, usually worse in the evening, when in the wind and after reading, but *relieved by the cool, open air*. The lids may be swollen, are not excoriated, but very *subject to styes*. The eyes feel worse on getting warm from exercise or in a heated room and generally in the evening, but are *ameliorated in the open air* and by cold applications. Gastric symptoms, amenorrhœa, and other concomitant conditions will influence our choice.

**Rhus tox.**—Useful in *pustular inflammation* after it has progressed to superficial ulceration of the cornea. Occasionally in *catarrhal conjunctivitis* and frequently in *purulent ophthalmia*. Of value in relieving the intensity of the symptoms found in conjunctivitis granulosa with pannus. Especially useful in

relieving the profuse secretion of tears. The *lids are red, œdematous and spasmodically closed so that we are compelled to use force to open them, when a profuse gush of tears takes place.* The *photophobia is intense* and the conjunctiva very red, even chemosed. There is usually a copious, thick, yellow purulent discharge. The child is usually cachectic and restless; head hot. The skin of the face is often covered with a Rhus eruption, and a rheumatic diathesis would especially suggest this remedy. The symptoms are usually worse at night, after midnight and in damp weather; the patients are restless at night and disturbed by bad dreams.

*Rhus rad.* has been employed with excellent results in *scrofulous ophthalmia* when the above symptoms were present.

**Sanguinaria.**—Benefit has been derived from its use in *catarrhal* conditions of the conjunctiva, with burning in the edges of the lids, worse in the afternoon. Hæmorrhages in the conjunctiva with tendency to trachoma; moderate discharge and pain.

**Sepia.**—Acute *catarrhal* conjunctivitis, with drawing sensation in the external canthi and smarting in the eyes, ameliorated by bathing in cold water and *aggravated morning and evening.* Conjunctivitis with muco-purulent discharge from the eyes in the morning and great dryness in the evening. This remedy has proven a most valuable one in those cases of recurrent conjunctivitis known as *vernal catarrh* and in *follicular* or *trachomatous* conjunctivitis, which is only observed in or always made worse by hot weather. Especially of value in *pustular* inflammation in women, either *occurring with or dependent upon uterine troubles*, particularly when the cornea is affected. The pains are usually of a drawing, aching, piercing character, aggravated by rubbing, pressing the lids together or pressing upon the eye. The conjunctiva may be swollen, with agglutination of the eyes morning and evening; considerable purulent discharge; edges of the lids raw and sore; feeling as if the lids were too tight and did not cover the ball; eruption on face, etc. All the symptoms are worse in the morning and evening and better in the middle of the day.

**Sulphur.**—This is the remedy, *par excellence*, in *phlyctenular ophthalmia* and is a valuable remedy in both acute and chronic *catarrhal* conjunctivitis. Its sphere of action is very wide and adapts it to a great variety of cases, especially *chronic, and occurring in*



*scrofulous children covered with eruptions.* The pains vary, though are usually of a *sharp, lancinating character, as if a needle or splinter were piercing the eye*; we may have a *sharp shooting pain going through the eye back into head from 1 to 3 a.m.*, which disturbs the sleep. Various other sensations may be present, as pressing, tensive, cutting or burning pains, a feeling of sand in the eyes, etc. The photophobia and lachrymation are usually well marked, but may be absent. The redness may vary greatly, but is usually considerable. The secretions also vary both in quantity and quality, but often, acrid and corroding and sometimes tenacious. Morning agglutination of the lids is commonly present. The lids are often swollen, burn and smart, as if bathed in some acrid fluid, or an itching sensation. They are frequently covered with an eruption, as well as the surrounding integument of the head and face. The patients are usually *feverish* and restless at night. All the symptoms are, as a rule, *aggravated by bathing the eyes, so that the child cannot bear to have any water touch them*; also usually worse in the open air.

**Syphilinum.**—Chronic recurrent *phlyctenular* inflammation in scrofulous, delicate children, especially if there is any taint of hereditary syphilis. The photophobia will be intense and lachrymation profuse.

**Terebinth.**—In *catarrhal* conjunctivitis with great redness, usually dark in color, with *severe pain in the eye and corresponding side of the head*. Some pain in the back, and *urine dark in color*.

**Thuja occid.**—Favorable results have been gained by the use of this remedy in conjunctivitis *trachomatosa*, when the granulations have been large, like warts or blisters, with burning in the lids or eyes, worse at night; photophobia and suffusion of the eyes with tears.

**Zincum.**—In conjunctivitis, especially when confined to the *inner half of the eye*, with much discharge; worse toward evening and in the cool air. Generally there is *itching*, and perhaps pain, *in the internal canthus*.

**Conjunctivitis Vernalis.**—This condition is sometimes called *spring catarrh*, but the name catarrh seems to us wrong, because there is no discharge in this disease. It is characterized by a phlyctenoid eruption on the conjunctival limbus, which becomes a

swollen ring, more or less large, encircling the cornea, the growths are hard, uneven, and of a brownish, gelatinous appearance. The swelling and redness are greater at the outer and inner sections of the conjunctiva. These nodules are unlike phlyctenules, in that they never ulcerate, and may remain with slight variations in size for years. The papillæ of the tarsus are broad and flattened, and over the surface of the conjunctiva appears a bluish-white film. It affects children especially from the seventh to the twentieth year, and almost always attacks both eyes. The great characteristic of this disease is that the annoyance—redness, photophobia and itching—comes on every spring, lasting through the warm weather, and goes off with the cool days of autumn and is entirely absent during the winter months. There is usually but slight photophobia, with occasionally some pain. The disease is rare, but is usually controlled after one or two seasons, without leaving any affection of the cornea behind.

TREATMENT.—See that given for *Conjunctivitis Phlyctenularis*. *Sepia* and *Nux vom.* have proven of especial value in this disease.

**Amyloid Degeneration of the Conjunctiva.**—This is a very rare disease which is occasionally confounded with granulations. It consists of a hypertrophy of the mucous membrane, especially of the upper cul-de-sacs and semi-lunar folds, which become of so great a thickness as to often protrude between the lids. The conjunctiva appears like a yellow gelatinous-looking mass, in the substance of which are semi-transparent granules, which are usually larger and more transparent than the granules of trachoma. On everting the lid the tarsus appears as though covered with wax. The tarsus is itself thickened and metamorphosed.

TREATMENT.—Excision of the mass.

**Pemphigus Conjunctivæ.**—This is an extremely rare disease that is generally found in conjunction with eruptions of pemphigus vulgaris upon the skin. It is manifested by raw spots upon the conjunctiva, which become covered with a gray coating, and undergo cicatricial contraction. By the formation of other spots which gradually pass through the same process of cicatrization, the whole conjunctiva in the course of months or years becomes involved. The cornea becomes cloudy and dry, and in

the bad cases the lids become completely adherent to the eyeball (symplepharon) and the eye is incurably blind. A very interesting case of this disease has been described by MacLachlan.\* Treatment of this disease has so far proven of no avail.

**Xerosis Conjunctivæ** is a dryness of the conjunctiva from atrophy. Where the whole stroma of the conjunctiva is affected it is called *parenchymatous*, and where the atrophy is superficial it may be called *partial or epithelial*. When confined to only a part of the mucous membrane it is called *xerosis glabra*, and when it occupies the entire structure, *xerosis squamosa*, and in the latter the cornea is usually affected, when it is termed *xerophthalmia*. This condition is usually caused by inflammations that leave cicatrices, as in diphtheritic and granular conjunctivitis and burns of the conjunctiva. Idiopathic parenchymatous xerosis is extremely rare, but may occur as a sequelæ of the desquamative skin diseases, especially psoriasis and pemphigus.

Epithelial xerosis is more common, and is usually a sequela of conjunctivitis vernalis, although it may be idiopathic. In this form we may find grayish-white patches of a satin-like lustre on the conjunctiva and most often on that part of the ocular conjunctiva left uncovered when the lids are opened.

In complete xerosis the conjunctiva is pale and-dry, with small scales; the cul-de-sac and semi-lunar folds are obliterated and the palpebral conjunctiva is directly continuous with that of the eyeball. The cornea is opaque, atrophied and diminished in all of its diameters. The Meibomian glands are atrophied, the ducts of the lachrymal gland and the puncta lachrymalis are obliterated. The absence of secretion causes dryness of the eye and the movements are limited by the retraction of the mucous membrane and the adhesions.

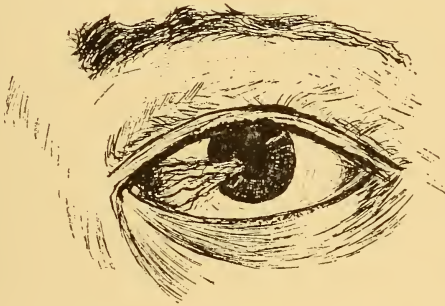
**TREATMENT.**—Can only be palliative, that is, ameliorate the excessive dryness which gives rise to so much heat and pain. Milk answers the purpose very well, or a weak solution of glycerine and water, to which one per cent. of salt should be added. Artificial serum is perhaps better still. "Cold expressed castor oil has also proved effectual."—*Thomas*.

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\* The Homœopathic Eye, Ear and Throat Journal, Vol. II., p. 35, 1896.

**Pterygium.**—Is a vascular triangular thickening of a portion of the conjunctiva. Its apex rests on the edge of the cornea. It may be movable or adherent to the globe, and its width varies. The most frequent location of a pterygium is over the internal rectus muscle, less frequently over the external rectus. It is called *membranous* when thin and not inflamed, and *sarcomatous* when thick and accompanied by more or less conjunctival catarrh. Pterygium grows very slowly and has a tendency to spread over the cornea, though rarely seen to grow beyond the centre of the pupil.

FIG 62.



Pterygium.

**CAUSES.**—Arlt says they are due to small ulcers at the corneal margin which, in cicatrization, draws the epithelium of the conjunctiva forward, which then folds upon itself and becomes inflamed and vascular. Horner says that it is the result of a pinguecula, forming a cavity between it and the corneal margin in which secretions and small foreign bodies become lodged; that these then cause ulcerations at the corneal border, which in cicatrization, draws the pinguecula upon the cornea. It occurs mostly in individuals who are exposed to constant irritation of the conjunctiva, from dust, etc., and is only found in adults.

**PROGNOSIS.**—Depends on the extent of the cornea involved and the tendency to progress as it only affects the vision when it has extended over the pupil. The cornea remains opaque after its removal and the growth may recur.

**TREATMENT.**—As a rule operative measures will have to be resorted to, both to prevent loss of vision and for cosmetic pur-



poses. Numerous methods have been advocated, chief among which are excision, ligation and transplantation.

*Excision* is perhaps the best and most frequently performed. The pterygium is raised with the forceps, a narrow knife is passed under the growth and a cut made to the corneal border; then, with a strabismus hook, pull it off from the cornea and with the scissors cut off at the base with converging incisions and unite the edges of the membrane with sutures—usually three.

*Ligation* is performed with a thread having a needle at each end. Raise the growth with the forceps and pass one needle from above downward under the growth near the cornea and the other at the base of the pterygium; now cut off your needles and tie the sutures; one takes in the base, the second the apex and the third detaches it from its posterior surface.

*Transplantation* is by detaching from the cornea and sclera so that it adheres only by the base, then make an incision in the conjunctiva below and parallel to the cornea and fasten the apex of the growth in this incision with sutures. When large it may be divided and inserted half above and half below the cornea.

**Zincum.**—Zinc has been more frequently employed and with greater satisfaction than any other remedy, especially in that form of pterygium which extends from the inner canthus (as it usually does), for the majority of the eye symptoms are found at the inner angle, as will be noticed by examination of the provings. The lachrymation is usually profuse and photophobia marked, especially by artificial light. The pains are pricking, with *itching and soreness in the inner angle* worse at night; also itching and heat in the eyes, worse in the cold air and better in a warm room; external canthi cracked; green halo around the evening light. There may also be present great *pressure across the root of the nose* and supra-orbital region.

**Calcareo carb.**—Especially indicated in *pterygium caused from exposure to wet and cold*.

**Chimaphila.**—This drug has been used with some success in many cases in which no marked indications have been present, though it has also often failed to improve.

Argent. nit., Arsen., Cannabis, Psor., Ratan., Spig. and Sulph. have also been used.

**Sub-conjunctival Ecchymosis**, or an effusion of blood beneath

the conjunctiva, may come from a blow, operations, or anything causing cranial congestions—the lifting of weights, coughing, vomiting, etc. It is quite common in old people with atheromata, and occurs in children with whooping cough, from vomiting, etc. Appears as a patch or deep red ring around the cornea. Looks alarming, but is generally of no importance, gradually disappearing of its own accord and presenting various shades during the process of absorption.

**TREATMENT.**—Applications of cold water, ice compresses, or a solution of one of the following remedies are advised, unless due to some chemical injury.

**Arnica.**—An important remedy for *traumatic conjunctivitis or keratitis, following blows and various injuries* of the eye. It is particularly called for *immediately* after the injury, before the inflammatory symptoms have really set in, though it is also useful in the later stages. Both spontaneous and traumatic hæmorrhages into the conjunctiva have been promptly absorbed under the use of Arnica. The relaxation of the blood-vessels and too fluid conditions of the blood, which predispose to these hæmorrhages in whooping cough, have seemed to be corrected by this drug.

**Ledum pal.**—Is more commonly called for in both *traumatic and spontaneous ecchymoses of the conjunctiva* than any other remedy. It also often seems to correct the tendency to hæmorrhage in these cases. Of value in inflammation of the conjunctiva in which extravasations of blood predominate.

**Hamamelis virg.**—Has proved very beneficial in traumatic conjunctivitis and keratitis consequent upon burns or other injuries. It also seems to hasten the absorption of conjunctival hæmorrhages. “Pond’s Extract” may be used locally.

**Aconite.**—There is no remedy more frequently useful than this in *inflammatory conditions of the eye resulting from the irritant action of foreign bodies*, as cinders, chips of steel, stone or coal, which produce a variable amount of redness and pain, with a sensation of *dryness, heat and burning* in the eye.

**Calendula.**—Useful in traumatic inflammation of the conjunctiva or cornea *following any operation* or resulting from a cut wound of any description.

**Cantharis.**—Ophthalmia traumatica *caused from any burn*, as from the flame of a candle, explosion of fireworks, etc., especially if characterized by much *burning pain* in the eye.

Any of the above remedies, with perhaps the exception of Cantharis, should always be used locally as well as internally in proportion of from ten to twenty drops of the tincture to the ounce of water. Compresses wet in this should be laid upon the eye.

Euph., Hep., Ign., Nux, Rhus, Sil. and other remedies may prove serviceable when special indications point to their use.

**Sub-conjunctival Emphysema.**—This is a puffy condition of the conjunctiva in which there is a sensation of crepitus to the touch, the swelling disappearing on pressure. It is of diagnostic value in other diseases, as it may be due to fracture of the orbital wall, opening a communication between the sub-conjunctival tissue and the nasal fossa, the frontal sinus or the ethmoidal cells. It also may occur from rupture of the lachrymal sac or tear passage, which allows the air to enter the tissues on blowing the nose.

**Tuberculosis Conjunctivæ.**—This disease is of rare occurrence, but that it does occur has been demonstrated by microscopical investigation. Knapp\* produced tuberculous disease in the eyes of rabbits by inoculation from a case of tuberculosis of the conjunctiva. The lymphatic glands of the neck on the same side as the affected eye are apt to be involved. The disease usually commences in the conjunctiva of the upper lid, occurs in young subjects and is apt to affect but one eye. There is a thickening of the eyelids, the swelling is somewhat reddened and of a soft, elastic feeling. On everting the lid the conjunctiva appears covered with exuberant granulations of grayish-red color which are somewhat flattened and of a nodular appearance. There may also be one or more ulcerations in the palpebral conjunctiva. These granulations seem to spring especially from the retro-tarsal fold and are accompanied by a profuse purulent secretion. The cornea may become affected with pannus. Arlt† says a positive diagnosis can only be made after a microscopical examination. Swan M. Burnett‡ reports a case that was undoubtedly of primary origin, and argues that the condition is more often primary than secondary.

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\* Archiv. Ophthal., vol. xix., 1, 1890.

† Klinische Darstellung der Krankheiten des Auges, S. 98, 1881.

‡ Archiv. Ophthal., vol. xix., 2, 1890.

TREATMENT.—Fontan\* advises scraping out the nodules and dusting iodoform upon them. The use of the galvano-cautery, as well as the knife to destroy the local products, is recommended by Knapp (*loc. cit.*). Internal medication, such as is used in tuberculous conditions elsewhere, should be followed.

**Lesions of the Conjunctiva.**—*Foreign bodies* penetrate the conjunctiva and may cause irritation, if not removed early. They are mostly found on the inner surface of the upper lid, 2 to 3 mm. from the posterior border; the shallow border between cornea and sclera; the upper fornix. If allowed to remain, they set up hyperæmia and catarrhal conjunctivitis. They should be removed.

*Wounds from sharp instruments*, so long as they do not involve other structures, are not important and readily heal. When extensive, clean the wound carefully, unite the edge with sutures and apply cold compresses.

*From burns and cauterisms by chemical reagents* there is caused thick, whitish patches that project above the mucous surface and may result in severe pain and inflammation. Danger depends on the size, their influence on the cornea and the amount of cicatrization causing symblepharon.

TREATMENT.—If dependent upon some foreign body which has lodged on the conjunctiva, the first point to be attended to is its removal, which is generally easily effected. After which, directions should be given to bathe the eye in cold water or a weak solution of *Aconite*, *Arnica* or *Calendula*. This will usually suffice, though in severe cases it may be advisable to drop a little olive oil into the eye after removing the foreign body.

*Chemical Injuries*, especially from lime, are, unfortunately, of frequent occurrence and very dangerous in their nature on account of the formation of deep sloughs, which have a great tendency to result in symblepharon. If seen early, we should endeavor to remove as much as possible of the lime and then drop into the eye either a little olive oil, oil of sweet almonds, milk, weak solution of vinegar, or some substance which will unite with the lime and form an innocuous compound. Water should never be employed. Great care should be taken while the wound is healing that no adhesions between the lids and ball occur. If there is a tendency

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\* Rec. d'ophth., No. 10, 1886.



in this direction, the adhesions should be broken up once or twice a day by means of a probe.

When the injury is from strong acids, as sulphuric or nitric, the eye should be syringed out with a weak solution of carbonate of soda or potassa (3j to 3vi aq. destil.) in order to neutralize the acid; afterwards olive oil should be dropped in. To relieve the severe pain a few drops of a 4% solution of cocaine may be instilled.

**Tumors of the Conjunctiva.**—Nearly all varieties of tumors, either benign or malignant, may occur in the conjunctiva, and will be but briefly referred to.

*Pinguecula* is a yellowish-white swelling, the size varying from that of a pin-head to a pea, situated usually on the nasal side and near to the cornea. Fuchs says: It consists of a thickening of the conjunctiva with increase of its elastic fibres and an infiltration of hyaline into the tissue elements. It contains no fat as is usually considered from the appearance of the swelling. They are due to erosions from foreign bodies, are of no importance and need no treatment.

*Dermoid Tumors* are small, smooth and of a yellowish-gray appearance, of a size varying from a pea to a hazel nut and are located at the margin of, and growing some upon the cornea. They are especially apt to be found at the lower and outer border of the cornea and hairs are sometimes seen growing from them. They consist, according to Fick, of a thick layer of stratified epidermis cells beneath which are connective tissue, fat cells, smooth muscular fibres, glands and hairs, all being tissues of the external skin. They are congenital, have a tendency to increase in size and are apt to recur, if not all removed. They should be removed for cosmetic purposes and because they are liable to gradually encroach more and more upon the cornea. Remove with a cataract knife, first from the cornea and then from the sclerotic. They enter very deep into the substance of the cornea, but it suffices to remove on a level with the cornea.

*Lipoma* is another rare, congenital and benign tumor which is most frequently found to the outer side, either above or below the external rectus muscle. They appear as flat, yellow swellings, and are apparently extensions of the fatty tissue of the orbit.

They do not disfigure much or interfere with the movements of the eye and should not be touched.

*Vascular Tumors.*—These are very rare, but we do meet them occasionally as a small triangular-shaped elevation of the conjunctiva which causes deformity by their bright red appearance. They are most frequently found associated with vascular dilations of the face or nose. They should be carefully removed by electrolysis.

*Angioma* spring from the caruncle or cul-de-sacs, and are seldom large enough to require removal; but when they do, may be removed by suture or electrolysis.

*Fleshy Excrescences* are usually from wounds or operations and should be removed.

*Cysts* are round, circumscribed, rose-colored tumors. They are semi-transparent and may take on a yellowish hue, sometimes grow to the size of a bean and contain a thick fluid. They are usually congenital, but may follow a blow on the eye, and should be either incised or removed entire.

*Erectile Tumors* are usually an extension from a similar tumor of the lid. They should be destroyed by excision, galvanocautery or electrolysis.

*Pigment Spots* are quite frequent and harmless. May be excised for cosmetic effect.

*Fibroma* and *Osteoma* have been found.

*Epithelioma*, while not common, are sometimes found on the ocular conjunctiva and at first may be mistaken for phlyctenules, but their persistence and the age of the patient will be apt to cause suspicion. When well advanced, they appear usually at the corneal margin as a puffy, reddish lobulated mass and are sometimes ulcerated. Their course varies—they may invade the cornea slowly or rapidly, but will do so sooner or later. They should be removed, and, if they return, the eye must be enucleated.

*Sarcoma and Melano-Sarcoma.*—The former are generally pedunculated and may cover the cornea without penetrating it. The latter are generally close to the corneal border and are rarely found on the tarsus or in the cul-de-sacs. If they seem to be rapidly progressing, there should be a careful examination made for general infection, and, if convinced that general infection is not imminent, the eye may be enucleated. There is always great danger of the growth returning after an operation, or of metastasis.

*Carcinoma* are extremely rare; but, when found, should be removed.

*Lupus* generally spreads to the conjunctiva from other structures and rarely occurs in the conjunctiva primarily. They are usually found on the lid in the form of fungous granulations, a soft doughy mass broken by cicatrices. They should be scraped away thoroughly with a curette and cauterized with nitrate of silver, 1 to 10.

*Entozoon or Cysticercus* may occur under the conjunctiva.

*Syphilitic Ulcerations* are usually found on the palpebral conjunctiva and cul-de-sacs. They have the usual hard base and indurated edges and give the syphilitic history.

*Gummata* have also been seen under the conjunctiva. The treatment should be both general and local.

## CHAPTER XII.

## Diseases of the Cornea.

**Anatomy.**—The cornea is nearly circular in shape, though slightly more prominent in youth than in old age. It is perfectly transparent and this transparency is due to the arrangement as well as the individual transparency of each of its constituent elements. The cornea is composed of five layers which, taken from without inward, are the anterior epithelial layer, Bowman's membrane, the substantia propria, Descemet's membrane and the posterior endothelial layer.

The *anterior epithelial layer* is like the epithelium in other parts of the body, though in this location it is composed of from six to eight layers of cells, varying in size and shape, with nuclei and nucleoli, the innermost ones having offshoots. This epithelium is more transparent and thicker, but continuous with that of the conjunctiva.

*Bowman's membrane* is simply a layer of corneal cement containing fibrillæ and fasciculi, but with no lacunæ or lymph canals, and, therefore, has neither fixed cells nor movable corpuscles. It is closely adherent to the cornea proper and cannot be separated from it as a distinct layer.

The *substantia propria* is made up of extremely fine connective tissue fibrillæ united into fasciculi. A cement substance binds the fibres and fasciculi together. There is a system of spaces, lacunæ, and lymphatic canals, canaliculi, which are a continuation of the lymphatic vessels and spaces. The corneal cells fill these lacunæ and their branching arms the canaliculi.

The *fibrillæ* and *fasciculi of fibres* are disposed in layers one above the other, forming in this way a structure made up of lamellæ, about sixty in number.

The *cement* is a homogeneous substance binding the fibres and fibrillæ together.

The *corneal spaces* are hollowed out of the compact tissue formed



by the cement and the fasciculi arranged in lamellæ and are composed of numerous lenticular-shaped shallow spaces communicating together by offshoots or canaliculi. These spaces have no proper lining and vary in size. They run from one layer to another and even penetrate between the fibres, thus forming a network throughout the corneal tissue. The canals convey the lymph for the nourishment of the cornea and the spaces contain the cells of the cornea, which are of three varieties—the fixed cells or corneal corpuscles, the migratory and the pigment cells.

The *fixed cells* lie in the lacunæ, are flattened, have both nuclei and nucleoli and send prolongations into the canal.

The *migratory cells* are distinguished from the fixed by their large and variable size, their brilliancy and the power of motion. They correspond to leucocytes and increase in number during inflammation.

The *pigment cells* are similar to the fixed cells, found only at the periphery of the cornea and are especially present in negroes.

*Descemet's membrane* is the inner lining of the parenchyma. It is a structureless, homogeneous membrane, of a glassy appearance and highly refractive. It is firm and elastic, and is supposed to be a condensation of the cement substance of the cornea proper.

The *endothelial layer* consists of a single layer of endothelial cells lining the posterior surface of the membrane of Descemet. The cells are flat and of varying shape and distinctly nucleated. At the periphery of the cornea this layer is reflected upon the ligamentum pectinatum iridis and thence upon the anterior surface of the iris.

Blood-vessels are only found on the outskirts of the cornea and are derived from the anterior ciliary arteries.

The nerves of the cornea, about forty in number, penetrate its tissue, lose their medullary sheath, become transparent and divide dichotomously to form large plexuses, which ultimately end in a fine plexus beneath the anterior epithelium. From this sub-epithelial plexus fibrils are given off which pass among the epithelial cells.

**Inflammation of the Cornea** may be either primary or secondary to inflammation of other tissues. It may induce inflammation of the adjacent structures, such as the conjunctiva, iris,

ciliary body, etc., or it may exist with inflammations of these structures.

Inflammation of the cornea is diagnosed by increased ciliary injection, a decreased transparency, a loss of lustre of the cornea or by ulceration. Vision is more or less disturbed, according to the location of the inflammatory foci, by the dispersion, absorption or irregular refraction of light. Keratitis is perhaps one of the most frequent diseases of the eye; it is also, considering the function of the eye, one of its most important affections. It endangers the function and also the form of the eye in many ways, viz.: by causing incurable opacities, by a permanent change in its convexity, by perforation and its sequelæ; by inducing iritis, iridocyclitis, etc.; by destruction of a portion or the whole of the cornea; by destruction of the form of the entire globe, as in staphyloma, phthisis bulbi, etc.; or, again, keratitis may run its course, leaving no bad results.

The classification of corneal diseases is as varied as the different writers upon this subject, each new author seeming to strive for some new name or sub-division to cover different types of the same disease. We have selected to follow in a general way the classification of De Wecker as being in our opinion the simplest and most practical.

**Keratitis Phlyctenularis.** — (*Eczema Corneæ, Scrofulous, Strumous, or Pustular Keratitis.*)

**PATHOLOGY.**—Consists of a circumscribed infiltration of leucocytes into Bowman's layer. This infiltration is always confined to the parts surrounding a nerve-branch as it pierces the epithelial layer. This simple local infiltration generally results in local purulent keratitis, with a loss of substance and the formation of a scar.

**SYMPTOMS.**—We will first notice small, grayish elevations upon some part of the cornea, usually the periphery, varying in size—perhaps, as a rule, about one-half the size of the head of a pin. There may be one such elevation or a row of them extending around the cornea. There will be a redness which may encircle the entire cornea, or more often, where there is but one phlyctenule, confined to the quadrant of the eye affected and assuming a more or less triangular-shaped injection, the apex of which will

be at the point of infiltration. The conjunctiva is often more or less inflamed, may be swollen and secretes a muco-purulent discharge. The photophobia is often so intense that the child will bury its face away from the light and it will be found difficult to open the eye for examination. Again, other cases will be met with in which there is not the slightest photophobia. The appearance of the vesicle is generally preceded or accompanied by a sense of heat and itching in the eyelids, lachrymation and ciliary neuralgia. Sometimes the phlyctenules are very superficial and appear as small, transparent vesicles, whose epithelial covering is soon shed, leaving a small excoriation which may easily escape detection. Generally, however, the infiltration is more apparent and is surrounded by a zone of opaque and swollen cornea; the apex breaking down, it extends in circumference and depth and forms an ulcer which usually becomes covered with a layer of epithelium and gradually fills up, the cornea regaining more or less of its transparency.

**COURSE.**—It is usually acute, though it may be very chronic, as there is a great tendency to relapses. Just as the symptoms of irritation and vascularity are subsiding, the phlyctenule disappearing and the disease seems to be almost cured, all the acute symptoms return, a fresh crop of pustules make their appearance and a severe relapse takes place. This may occur again and again and the affection assume a chronic character.

**CAUSES.**—It is most frequently found in children and young persons of a weakly, scrofulous constitution and those of a nervous, excitable temperament. It is often found after the exanthematous diseases or in eczema of the face, from confinement in close, dusty rooms, after exposure to cold or moisture.

**PROGNOSIS.**—Depends upon the course and extent of the disease. Each attack in itself should be promptly treated, when it will usually heal in a short time, as it yields readily to treatment. When due to scrofula there will probably be relapses and more or less loss of sight will occur from macula, if the location be central.

**TREATMENT.**—As the treatment of this disease is precisely the same as that for conjunctivitis phlyctenularis, what is there said of treatment applies as well to keratitis phlyctenularis and avoids unnecessary repetition. (See *Conjunctivitis Phlyctenularis*, page 213.)

**Keratitis Fascicularis.**—This disease is very similar to and may occur with phlyctenular keratitis. It consists of a vascularized infiltration in which there is a narrow band of vessels running parallel to each other and extending into the cornea. At the end of this fasciculus of vessels there is a more or less crescentic-shaped infiltration, which is often ulcerated. There is usually but one such infiltration, although several may occur at the same time. There are the usual symptoms of pericorneal injection, photophobia and lachrymation. The affection is mostly found in scrofulous children and its treatment is the same as that for phlyctenular keratitis. The yellow oxide of mercury ointment is often of especial value in this form of keratitis.

**Keratitis Pannosa** is a vascular superficial inflammation of the cornea.

**PATHOLOGY.**—There is a formation of a neoplastic layer of cells beneath the epithelium and also in the corneal layers just beneath Bowman's membrane. These cells develop into connective tissue, and blood-vessels, and capillaries form in them. There are two sets of these vessels—one a venous set continuous with the conjunctival vessels, and a deeper arterial layer arising from the conjunctival and sub-conjunctival vessels. Where the cornea is very red, opaque and of a fleshy appearance, it is called *pannus crassus*; if the blood-vessels are few and the cloudiness is slight, it is then called *pannus tenuis*.

This condition is sometimes classified according to its cause, *pannus trachomatous* when due to trachoma, *pannus eczematous* when found in eczematous or phlyctenular ophthalmia, and *pannus traumaticus* when due to trichiasis, entropion, etc.

**SYMPTOMS AND COURSE.**—In the acute form of the disease we may find photophobia, lachrymation, ciliary neuralgia and both conjunctival and sub-conjunctival injection. When it becomes chronic, the irritability is but slight. The cornea becomes opaque, rough, uneven and filled with ridges. The disease usually extends from the periphery, where it is the thickest, to the centre, but it may be the reverse. Superficial and even deep ulcers may form in the pannus. The cornea may become bulged from a long-existing pannus causing a thinning and weakening of the cornea; or the reverse, flattening and atrophy of the cornea may ensue



from sclerosis and contraction of the new tissue within the corneal layers.

CAUSES.—In a large majority of the cases it is due to trachoma, and is produced by the friction of the roughened conjunctiva on the cornea. From this cause the disease is usually confined to the upper half of the cornea, or affects that portion first. Pannus may also result from phlyctenular or purulent ophthalmia; from the friction and irritation due to inverted eyelashes, entropium or chalazion, or from exposure to external irritants, as in lagophthalmos.

PROGNOSIS.—If the case is recent and inconsiderable and the cause remediable, the prognosis is favorable; but in chronic cases the normal transparency of the cornea can never be restored and the ultimate effect upon the vision will depend upon the extent of the corneal invasion.

TREATMENT.—This should, of course, be mainly directed to the cause of the pannus, as elsewhere described. The general health should be promoted and the eyes may be protected from all intense light. In some of the indolent cases, where the pannus is dense and does not clear up after the relief of the cause, the use of warm fomentations applied for about one-half hour at a time, two or three times a day, together with massage with the yellow oxide ointment, may be of service. *Atropine* may be of service where the vascularity is excessive and should be used when there is a tendency to iritic complications. *Eserine*, however, seems to have a directly beneficial result as an aid to the healing process; but in using *eserine* the iris must be carefully watched for pupillary adhesions. The operation of *syndectomy*, in all cases due to trachoma where the cornea remains opaque and vascular after the granular lids have passed over into the cicatricial stage, may sometimes be very serviceable. The operation consists in dissecting away a narrow strip of the conjunctiva close to the corneal border for either a portion or the entire circumference of the cornea.

The administration of the homœopathic remedy is, however, the most essential part of the treatment. *Acon.*, *Aurum.*, *Hepar.*, *Merc. sol.*, *Rhus tox.* and *Sulphur* are perhaps the ones most often of value. For special indications for the use of these and other drugs, see treatment of *Ulcus Corneæ*, page 241.

**Keratitis Vesiculosa** (*Herpes Corneæ*).—Small, roundish

vesicles filled with serum appear upon the surface of the cornea and usually form in a line running across the cornea. They are due to a circumscribed upraising of the epithelium, in which a thin layer of the cement substance takes part. The disease appears in paroxysms, with very severe pain, which is only relieved upon the shedding of the vesicular envelope and the formation of a slight excoriation.

CAUSE.—The cause of this affection is probably some inflammatory change in the fifth nerve, as evidenced by its frequent association with ophthalmic herpes zoster, and also by the fact that the severe neuralgic pain usually precedes and often continues after the vesicles are healed. The disease is periodic, subject to relapses and leads to no serious lesion. It is accompanied by little or no inflammatory symptoms and the presence of the vesicle from its small size and transparency is often difficult to recognize.

DIAGNOSIS.—This disease may be mistaken for phlyctenular keratitis, but in this the elevations are clear, while in phlyctenules they are flatter and more greyish in color. In herpes there is no vascularization and the disease is rarely found under puberty. Phlyctenular keratitis is usually associated with more or less vascularity and is a disease of childhood.

The *treatment* should be by the application of warm fomentations, instillations of cocaine, electricity and the removal of the epithelial covering of the vesicle with forceps.

**Ulcus Corneæ.**—The clinical sub-divisions of corneal ulcers are almost innumerable, it seeming from examination of the various text-books as though each author strove to find some new name for each differently located or shaped ulceration of the cornea. It has, therefore, been thought best to place the general study of all ulcers under one heading, with brief mention of one or two of the more distinctive varieties to follow.

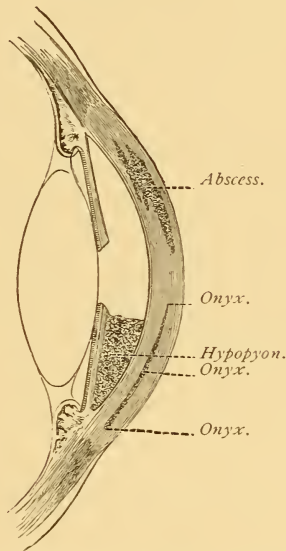
**PATHOLOGY.**—The pathological changes in an ulceration of the cornea are, of course, the same in all cases (irrespective of any clinical sub-divisions), with the exception or variation as to the extent or amount of tissue involved, and hence the following description is applicable to all forms of corneal ulcerations: There is at first an infiltration of leucocytes into the cornea lamellæ

lying next to Bowman's membrane. The number of these cells increase and Bowman's layer, together with the epithelium, becomes raised and the latter begins to necrose. The destruction is first noticed in the epithelial layer, then the lamellæ and Bowman's membrane become destroyed and an ulcer is formed. The base of the ulcer is covered with pus, its walls are ragged and the adjoining tissue is filled with round cells. The epithelium surrounding the ulcer is thickened from proliferation of its cells. The lamellæ, forming the base and walls of the ulcer, become bent toward the surface at an angle of about  $45^{\circ}$ . The ulcer from this stage may progress by the surrounding parts becoming more and more infiltrated and destroyed as described, or it may proceed to reparation, in which case the bottom of the ulcer cleanses itself, its margins lose their ragged appearance and vessels extend to the ulcer from the limbus. This is followed by a marked and rapid proliferation of the epithelium extending from the sides over the walls and base of the ulcer, while at the same time a new and delicate connective tissue formation is taking place upon the base of the ulcer beneath the epithelium and gradually pushing it forward until it has completely filled up the ulceration, so that the new epithelial layer becomes continuous with that of the healthy cornea. The new epithelial cells are mostly round, though sometimes cylindrical or spindle-shaped. This new formed tissue later becomes more dense and tough and assumes somewhat of a lamellar arrangement, but the lamellæ are smaller, more irregular and intersect at obtuse angles. This new tissue is translucent, and, although it may clear up somewhat, it never becomes perfectly transparent. If the ulceration extends, growing deeper and deeper, there is first a protrusion of Descemet's membrane (*keratocoele*), due to the loss of substance, causing a diminished resistance to the intra-ocular pressure, and later a perforation of the cornea with a prolapse of the iris into the corneal wound, where it may become attached.

**SYMPTOMS.**—The first objective symptom noticed is that the patient usually enters the room with the eyes wholly or partially closed from the dread of light, and, upon attempting to examine the eye, as we raise the lid the eye rolls upward in order to hide from the light and a flow of tears will result as the light strikes the eye. As a reverse to this, which may be called the usual oc-

currence, we may sometimes find cases with the eyes widely open and without the slightest photophobia. On opening the eye we are attracted to the redness of the eye, which is due to the injection of both the conjunctival and sub-conjunctival vessels and which varies greatly in degree. Then, upon examination of the cornea, we find at some point a loss of corneal substance, that is, instead of seeing the normal, smooth, glistening epithelial layer,

FIG. 63.



Vertical section through anterior part of the globe.

we notice a depression which is opaque, saturated with pus and has ragged edges. The depression is usually irregular, though of a general circular shape. The corneal tissue is also opaque for a varying extent around the ulcer from purulent infiltration of its lamellæ. Sometimes one or more blood-vessels may be seen running to the ulcer from the corneal margin. There may also be present a collection of pus in the anterior chamber (*hypopyon*) or a burrowing of pus in the substance of the cornea (*onyx*) (Fig. 63) or a bulging of Descemet's membrane in the base of the ulcer (*keratocèle*).

Subjectively the patient will usually complain of more or less



intense photophobia, lachrymation and ciliary neuralgia, all due to an exposure of the terminal filaments of the corneal nerves from loss of substance, and from this we will sometimes find a slight superficial ulceration, creating more disturbance than will sometimes be present in a deeper and far more serious ulcer. Occasionally there will be met cases of slight superficial ulceration, hardly more than abrasions of the epithelium, with but very little redness, yet the most intense photophobia (so much that the child will lay all day with the head buried from the light) which will last for months without in the least yielding to treatment.

COURSE.—In a majority of cases the course of an ulcer is acute and rapid, but in others it may be chronic and protracted, obstinately defying all treatment until perhaps perforation has taken place, when it will at once begin to heal. In favorable cases only the portion of the cornea involved in the primary infiltration breaks down, when the ulcer cleanses itself and rapidly heals. Very often, however, the infiltration extends, involving the healthy cornea either in depth or breadth, breaks down into pus and the ulceration increases in size or depth. In the former case larger opacities result, while in the latter perforation threatens. The extension of the ulcer may take place in one direction while repair is going on at the other end (*serpiginous*).

CAUSES.—Corneal ulcers frequently occur from some form of conjunctivitis, and are apt to vary in degree, according to the severity of the conjunctival disease, from a superficial abrasion to a slough of the entire cornea. Injuries frequently lead to ulcerations of the cornea in various ways. A foreign body removed by inflammation and suppuration leaves an ulcer. Wounds or operations may result in ulcerations when the healing by first intention is prevented by impurities, by re-opening, or by bad adaptation of the wound. Chemical agents may produce a slough. Friction of the cornea, from inverted eyelashes, from calcareous concretions or foreign bodies in the tarsal conjunctiva or colds, may cause either an ulcer or an abscess. Paralysis of the orbicularis palpebrarum, ectropium, exophthalmic goitre, etc., cause ulcerations from exposure of the cornea to external irritants. Deficient nutrition in children, and the exanthematous diseases are very common causes. Corneal ulceration is frequently found in the working classes, due to neglect of some conjunctival catarrh and their

greater liability to injuries which at the same time carries infectious matter into the wound.

PROGNOSIS.—Favorable as a rule, but depends upon the condition of the ulcer, and upon the age and general condition of the patient. When situated near the centre of the cornea the vision is much interfered with, and when more peripheral the vision is but slightly, if at all, affected. Ulcers that have advanced as far as the substantia propria always leave an opacity. Superficial ulcerations are far more favorable as to the resulting opacities than are deep ones. Ulcers that heal with vascularization of the cornea leave opacities. In children and youth there is always a more complete regeneration than in advanced age. Very deep ulcerations from ophthalmia neonatorum may heal with only a slight opacity. In old or debilitated persons there is often a more extensive opacity than would be expected from appearance. Irritants, such as dust, smoke, etc., increase the density of an opacity. In cases of *central* ulceration always advise the patient at the first examination that there will be more or less loss of vision.

RESULTS.—If an ulceration extends and causes a perforation of the cornea, a long train of results may follow. When the perforation occurs, the aqueous flows off and the iris and lens come forward into apposition with the cornea. If the perforation is small, as the anterior chamber refills, the iris may be forced backward into place and the cornea heal with no synechia, but, in larger perforations, the iris falls into its margins, or bulges through, and, the cornea healing, it is held there as a synechia called *leucoma adherens*, or prolapsed iris; the latter, exposed to external irritants, may become purulently inflamed and be the starting point of a purulent irido-choroiditis. If the entire cornea is destroyed there is a total adhesion of the iris to the cornea (*leucoma adherens*) and the new cicatricial tissue may not withstand the intra-ocular pressure, and staphyloma, either partial or total, results. Instead of staphyloma resulting from the cicatricial tissue, it may flatten and atrophy of the globe follow. If the rupture of the cornea is extensive and sudden, from a fit of coughing, sneezing, etc., there may occur a dislocation of the lens or even its entire escape from the eye, a prolapse of the vitreous, or an intra-ocular hæmorrhage. Occasionally a perforation will not heal, leaving a fistula of the cornea. An anterior capsular cataract may result from a small central perforation.

TREATMENT.—Our chief reliance must be placed upon the carefully selected homœopathic remedy, as by the use of our remedies we can greatly cut short the course of the disease. Superficial ulcerations of the cornea will not usually require local treatment, unless caused by granular lids (see *Conjunctivitis Trachomatosa*, page 204), or by entropium, inverted lashes, etc., in which case the cause must, of course, be first removed. Severe cases, not dependent upon granular lids or traumatic causes, will be greatly improved by the use of a *bandage*. *Atropine* may be of service in rare cases, with much photophobia and deep ciliary injection, though it is not commonly necessary under appropriate homœopathic treatment. If the palpebral aperture is much shortened and the eyelids thus press upon the eyeball, the outer canthus may be divided (*canthoplasty*) so as to relieve the increased pressure on the cornea.

In the treatment of ulcers and abscesses of the cornea, local and dietetic measures are of great importance. If the ulcer is extensive, the patient should be directed to remain quiet in the house (in bed, if possible), that absolute rest may be obtained. As this disease is more often found in weak, debilitated subjects, a very nutritious diet should be prescribed, and it may even be necessary to use stimulants; in these cases, the concentrated tincture of *avena sativa*, ten-drop doses four times a day, or the use of *cod liver oil*, will be found of great service.

As a rule, *cold applications* are injurious, except occasionally in the first or inflammatory stage of superficial keratitis, or in ulceration of the cornea occurring during the course of pannus. *Hot poultices* also are not advised, except in indolent ulcers which are deep, non-vascular and have no tendency to heal, in which they may often be employed with advantage.

Bandaging, upon the other hand, is of the utmost importance in the treatment, even in some cases, producing a cure alone. In all cases in which the ulcer or abscess is deep, or obstinate to treatment, a protective bandage should be immediately applied. It is usually sufficient to bandage only the affected eye (if one be healthy), unless the ulcer be very deep and extensive, when both eyes should be covered. The objects of the bandage are, to keep the eye quiet and protected by its natural coverings, the lids, from all irritating causes, such as wind, dust, etc., and to keep

the eye warm, in order to promote local nutrition. The bandage is also of much value when the ulcer is deep and shows a tendency to perforate; it then serves to support the thinned portion of the cornea against the intra-ocular pressure.

*Atropine* is not usually required in ulcers or abscesses of the cornea, unless the ulcer is central and has a tendency to perforate, or if iritis complicates the corneal trouble; then Atropine should be employed until full dilatation of the pupil is produced, which should be maintained. It may also be of service in relieving the great irritability and intense photophobia observed in some obstinate forms of corneal inflammation.

*Eserine* should be instilled if the ulcer tends toward perforation at the periphery, or if the intra-ocular tension becomes increased.

*Aqua chlori* used locally has proved beneficial in some cases, especially in the *crescentic form* and when the discharge of pus has been profuse. It may be used pure, or diluted one-half, one-third, or even more. The peroxide of hydrogen and pyoktanin may also prove of much service in cases where the ulcer is accompanied by a considerable purulent discharge.

The use of the *galvano-cautery*, as described under *hypopyon keratitis*, has proven most valuable in many severe cases.

In those cases in which the ulcer is deep, with a great tendency to perforate, *Sæmisch's incision* is recommended. It consists in cutting through the base of the ulcer into the anterior chamber with a Graefe cataract knife, which is entered in the healthy tissue on one side and brought out in the healthy tissue on the other side of the ulceration, which is then divided by a sawing movement of the knife, after which Atropine is instilled and a compress bandage applied. The wound can be kept open by the aid of a spatula or Daviel's spoon, for two or three days if desirable.

*Paracentesis* may also be resorted to in the above cases, though it has been nearly supplanted by Sæmisch's incision, which, in the majority of instances, is far preferable. The puncture should be made with a fine needle, through the deepest portion of the ulcer, the aqueous allowed to flow off as gently as possible and a compress bandage applied. It is not necessary to wait too long before making a paracentesis, as it aids repair by relieving the pressure from intra-ocular tension and may be repeated several times, if



necessary. We have often found very good results from Felchenfeld's\* method of scratching out superficial corneal ulcers with a gouge or needle and then applying an antiseptic dressing. All ulcers should be closely watched, that we may detect any hernia of the cornea or prolapse of the iris as soon as they occur. If a prolapse has taken place and is of recent origin, we should endeavor to replace it, either by dilating or contracting the pupil according to its situation; if this proves inadequate, the protruding iris should be snipped off with a pair of scissors, Atropine instilled and a pressure bandage applied.

In some very indolent ulcers the application of a mild irritant, such as the powdered calomel, or the yellow oxide of mercury ointment, page 107, will materially aid the process of repair.

**Hepar.**—This is one of the most frequently indicated remedies for ulcers and abscesses of the cornea, especially for the *deep, sloughing form and when hypopyon is present*. Also useful in acute aggravation of pannus tending toward ulceration.

Some torpid forms of ulcers and abscesses have been benefited, though usually the symptoms are well pronounced when this drug is indicated. There is *intense photophobia*, profuse lachrymation and *great redness of the cornea and conjunctiva*, even chemosis. The *pains are severe and of a throbbing*, aching, stinging character, *ameliorated by warmth and aggravated by cold or uncovering the eye* and in the evening. There is marked *sensitiveness of the eye to touch*. The lids may be red, swollen, spasmodically closed and *bleed easily upon opening them*. *For the absorption of pus in the anterior chamber (hypopyon) there is no better remedy than Hepar*. Cases found in strumous, outrageously cross children, should suggest this drug. Generally symptoms of chilliness, etc., are important.

**Mercurius sol.**—Mercury in some of its preparations is a common prescription for ulcers and abscesses, and as the soluble mercury of Hahnemann is perhaps more commonly employed than any other, we shall describe this more in detail and afterward give simply the variations found in the other forms.

Is adapted to both superficial and deep ulceration, especially in *symphilitic* or strumous subjects. The cornea, at the point of ulcera-

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\* Zehender's klin. Monatsbl. f. Augenheilk., vol. xxviii., p. 502.

tion, is usually quite vascular, though may be surrounded by a grayish opacity, due to infiltration between its layers; the conjunctival redness is also marked. The *dread of light* is generally great, especially of artificial light, and the *lachrymation is profuse, burning and excoriating, while the discharges are thin and acrid* in character. The pains are often severe and vary in character, but are *always aggravated at night*, by damp weather or extreme cold and ameliorated temporarily by cold water. The lids are thick, *red, swollen and excoriated by the acrid discharges*, sensitive to extreme heat or cold and to contact and are forcibly closed. The concomitant symptoms of excoriation of the nostrils, flabby tongue, night-sweats, pain at night, etc., are usually present.

**Calcarea carb.**—Particularly valuable for *corneal ulcerations found in fat, unhealthy children* with large abdomens, who sweat much, especially about the head and are very susceptible to cold air; also in deep, sloughing ulcers, found in weak, cachectic individuals. The pains, redness, photophobia and lachrymation are variable, and, though it is a prominent remedy for this disorder, there are no characteristic eye symptoms and we are guided in its selection chiefly by concomitant indications.

**Calc. iod.**—Ulcerations in strumous subjects, with enlargement of the tonsils and cervical glands.

**Calc. hypophos.**—This preparation of lime is most commonly called for in *deep sloughing ulcers* or abscesses found in weak, debilitated individuals. Especially indicated in *crescentic ulcers* following purulent conjunctivitis.

**Arsenicum.**—Especially when found in scrofulous, anæmic, restless children. The ulceration is chiefly superficial and has a tendency to recur first in one eye and then in the other.

The *photophobia is usually excessive* and the *lachrymation hot, burning, acrid and profuse*. The pains are *burning, sticking*; there may be throbbing, pulsating, or tearing, around the eye, *worse at night*. The *burning pains* predominate and are worse at night, especially after midnight, when the child becomes very restless and cross. Bathing in cold water often aggravates, while warm water may relieve. Eyeballs sore to touch. Conjunctiva quite red; chemosis. Marked *soreness on the internal surface of the lids*, which are swollen externally (œdematous), spasmodically closed and often *excoriated by the acrid discharges*.

**Rhus tox.**—*Superficial keratitis, with excessive photophobia and lachrymation, so that the tears gush out upon opening the spasmodically closed lids*; if a child, will often lie with its face buried in the pillows all day. *Profuse flow of tears* is a very important symptom under this drug, and benefit is frequently derived from its use in *superficial ulceration of the cornea with granular lids* in which this symptom is prominent. Keratitis caused from *exposure in the water* often calls for Rhus (Calc.).

The redness of the eye is generally marked, with *chemosis*. *The lids are œdematously swollen, especially the upper*. An eruption may frequently be found around the eye, characteristic of the drug. The symptoms are *generally worse in damp weather and at night after midnight*, therefore the patients are restless at night and disturbed by bad dreams. A rheumatic diathesis would also influence our choice.

**Conium.**—An important remedy in superficial ulceration in which the *surface* of the cornea only is abraded. Thus, owing to the exposure of the terminal filaments of the nerves or to hyperæsthesia, there is *intense photophobia* and much lachrymation. On account of the great photophobia the lids are spasmodically closed, and when opened a profuse gush of tears occurs (Rhus). The discharges are usually slight and the pains variable, though aggravated by any light. But, notwithstanding all this photophobia, pain and lachrymation, we find upon examination *very little or no redness of the conjunctiva*, not sufficient to account for the great photophobia, which is out of all proportion to the amount of trouble. Strumous conditions, enlarged glands, etc., would assist us

(Conium  $\theta$  has sometimes cured when the higher potencies have failed.)

**Sulphur.**—Both acute and chronic cases have been relieved, though it is more often to be thought of in the latter form, even in cases in which the destruction of tissue is great and *pus is present in the anterior chamber*, especially if the inflammation be indolent in nature, with no photophobia and but slight vascularity. Ulcerations occurring in or dependent upon a *scrofulous diathesis*, as shown by eruptions, etc., suggest this remedy. The most prominent eye indications which would lead us to its selection are the pains which are usually *sharp and sticking as if a*

*needle or splinter were sticking in the eye, or there may be sharp. shooting pains through the eye into the head from one to three A. M.* (The severe pains through the eye into the head, during the day or evening, rarely call for Sulphur, but for Spig., Bry., Cimicif., or the like.) Again we may have a great variety of other sensations. *The intolerance of light is generally great and the lachrymation profuse, though both are variable.*

**Mercurius' prot.**—*Serpiginous ulceration* of the cornea that commences at the margin and *extends over the whole cornea, or a portion of it, especially the upper part, involving only the superficial layers.* This form of ulceration is more commonly found during the course of *trachoma and pannus*, in which the protoiodide of mercury has often proved its value. *The vascularity of the cornea and conjunctiva is usually great, while the photophobia is excessive.* The pains are the same as those given under Mercurius sol. Non-vascular central ulcer of the cornea with pain at night. *A thick yellow coating at the base of the tongue is generally present.*

**Kali bichrom.**—Especially of value in those cases of *indolent ulceration*, which prove so intractable to treatment; cases in which there is no active inflammatory process, only a low grade of chronic inflammation, therefore marked by *no photophobia and no redness.* The pains are generally slight and variable and the discharge, if any, of a *stringy* character. Ulcers which have a tendency to bore in, without extending laterally.

**Graphites.**—A very valuable remedy in ulceration of the cornea, especially occurring in scrofulous children who are covered with eczematous eruptions, particularly on the head and *behind the ears*; eruptions are *moist, fissured and glutinous.* Is especially adapted to *superficial ulcerations resulting from pustules*, though it has also been useful in deep ulcers even with hypopyon. The cornea is more frequently found quite vascular and conjunctiva much injected, though both may be slight in degree. *The photophobia is usually intense* and the lachrymation profuse, but may be very moderate in amount. The pains are variable and the discharges generally thin and excoriating. The lids are sometimes covered with *dry scales* (the edges), though they are more commonly red and sore, with *cracking and bleeding of the external canthi* upon any attempt to open the eyes. Generally accompanying the above



symptoms we find an acrid discharge from the nose, which makes the nostrils sore and covered with scabs.

Photophobia is generally present, as well as *profuse, acrid, burning lachrymation*, together with *profuse, acrid, yellowish-white, muco-purulent discharge from the eyes*, which makes the lids red and excoriated, giving them and the cheek an appearance as if varnished. The conjunctiva is quite red and the eyes smart and burn. *Blurring of the eyes, relieved by winking.*

**Ipecacuanha.**—Vascular ulceration of the cornea, with *much photophobia.*

**Pulsatilla.**—Superficial ulcers, especially in females of a mild temperament. *Thick, bland, white or yellow discharge from the eyes and general amelioration of the symptoms in open air.* Small ulcers on the centre of the cornea, with no vascularity and only moderate irritation of the eye.

**Silicea.**—Adapted to *sloughing ulcers* of the cornea and the crescentic form of ulceration; also to *small, round ulcers* which have a tendency to perforate, especially if situated near the centre of the cornea and having no blood-vessels running to them. Pain, photophobia, lachrymation, redness and discharges vary, though the latter are generally profuse in the sloughing form of the disease. Hypopyon may be present. The Silicea patient is usually *very sensitive to cold* and therefore wishes to keep wrapped up warm, especially about the head.

**Cinnabaris.**—When accompanied by that characteristic *pain above the eye, extending from the internal to the external canthus or running around the eye.* This pain varies greatly both in intensity and character. Photophobia and lachrymation are usually present.

**Argentum nit.**—*Ulceration of the cornea in new-born infants, or from any form of purulent ophthalmia, with profuse discharge from the eyes.* Ulceration with pains like darts through the eye morning and evening. The pains are usually better in the cool, open air and aggravated in a warm room. The lids are generally red, thick and swollen; conjunctiva oedematous and there is a *profuse discharge of yellowish-white pus.*

**Aconite.**—Superficial ulceration of the cornea of *traumatic origin.* First stage of ulceration caused from exposure in the open air. Conjunctiva very red, chemosis, photophobia and lach-

rymation; or, more commonly, the eye is *dry, hot, burning* and very sensitive to air. Patient restless, feverish and thirsty.

**Apis.**—Ulcerations of the cornea, vascular, with photophobia, hot lachrymation and burning, *stinging pains*; sometimes the pains are very severe and *shoot* through the eye, with swollen, *œdematous condition of the lids* and conjunctiva. Patient drowsy and thirstless.

**Arnica.**—Traumatic ulceration with much *hæmorrhage into the anterior chamber*. (Superficial traumatic ulcerations generally yield more readily to Aconite.)

**Asafoetida.**—Ulceration, accompanied by iritic pains which *extend from within outward, and are relieved by rest and pressure*.

**Aurum.**—Ulceration of the cornea, especially occurring during the course of *pannus* or scrofulous ophthalmia. Cornea quite vascular, and the patient very irritable and sensitive to noise. Cervical glands often enlarged and inflamed. The *photophobia* is marked, *lachrymation profuse and scalding and the eyes very sensitive to touch*. The pains extend from without inward and are worse on touch (reverse of Asaf.).

**Belladonna.**—Superficial ulceration of the cornea, with intense photophobia and some throbbing pain, aggravated afternoon and evening.

**Cantharis.**—Superficial ulceration caused by burns, with burning pains and lachrymation.

**Chamomilla.**—Ulceration occurring in cross, peevish children during dentition.

**Chininum mur.**—Ulceration of the cornea of *malarial origin* or dependent upon *anæmic conditions*, especially if the iris has become affected and there are *severe pains*, either in or above the eye, *periodic in character* and accompanied by chills. Ulcers found in the course of *pannus*, with much pain in the morning.

**Cimicifuga.**—Ulcers with *sharp, neuralgic pains through the eye into the head*.

**Croton tig.**—Ulceration, with marked pain in the superciliary region at night, especially if accompanied by a *vesicular eruption on the face and lids*.

**Cundurango.**—Superficial ulceration, with sores or cracks at the corners of the mouth.

**Duboisin.**—Low form of ulceration, more or less deep, *without photophobia and lachrymation*.

**Eserine.**—Sloughing ulceration of the cornea, with tendency to increased intra-ocular tension.

**Euphrasia.**—Superficial ulceration (sometimes with pannus) may be relieved, though it rarely affects beneficially any extensive ulceration, except to palliate the symptoms in the first stage.

**Hamamelis.**—When dependent upon a blow or burn, especially when complicated with hæmorrhage into the anterior chamber (hypæmia).

**Mercurius corr.**—Called for when the mercurial symptoms are especially severe, particularly if the iris has become involved. The *photophobia, acrid lachrymation, discharges, pains, burning and excoriation of the lids are excessive* (which are often found in those of a scrofulous diathesis).

**Mercurius dulc.**—Deep or superficial ulcers or abscesses found in *pale, flabby, strumous children*, with enlarged glands and general scrofulous cachexia. Other symptoms vary little from Merc. sol.

**Mercurius nitr.**—Has been used empirically with excellent success in all kinds of ulceration, both in the acute and chronic, superficial and deep forms, whether accompanied by hypopyon or not, in cases in which there has been much photophobia, and in cases in which there has been none, where there has been much pain and where there has been no pain. In fact, it has been successfully employed in all imaginable forms of the disease, but it seems to act better in those cases in which there is a tendency to the formation of pustules. It is generally prescribed both externally and internally at the same time and in the lower potencies; the first potency in water externally and the third internally.

**Mercurius præc. rub.**—Ulceration of a cornea covered with pannus, lids granular and usual eye-symptoms of mercury. Aggravation from working over a fire.

**Natrum mur.**—Photophobia usually marked, so that a child will lie with the head buried in the pillows, *lachrymation acrid*, discharges thin and excoriating, lids swollen, eruption around the eye on face which is often *shining*, pains various, though often *sharp and piercing above the eye on looking down*, are the most prominent eye indications. Concomitants will decide our choice.

**Nux vom.**—*Superficial ulceration* of the cornea characterized by *excessive photophobia, especially in the morning*; during the day is often comparatively free from it. The amount of redness is not

usually excessive, though it varies, as does also the character of the pains. Lachrymation is profuse. To be thought of in cases that have been previously over-dosed with medicine, both externally and internally. Neuro-paralytic inflammation of the cornea has been benefited.

**Spigelia.**—Ulcers with sharp, shooting pains through the eye and into the head.

All the symptoms are, as a rule, *aggravated by bathing the eyes*, so that a child cannot bear to have any water touch them.

**Thuja.**—Ulcerations of a syphilitic origin, even when hypopyon is present, suffusion of the eyes and burning in them. Pain over the eye as if a nail were being driven in.

The following remedies have also been followed by favorable results in occasional cases: Alumina, Baryta carb. and jod., Cannabis, Caust., Chin. ars., Kali carb., Kali mur. and jod., Kreos., Nitric ac., Petrol., Sang., Secale, Seneg., Sepia and Vaccin.

**Hypopyon Keratitis** (*Ulcus Corneæ Serpens, Serpiginous, Infecting*).—Many of the deeper ulcers of the cornea just described, as well as abscesses, are accompanied by a deposition of pus in the anterior chamber (hypopyon) and hence are apt to be diagnosticated as hypopyon keratitis. (See Chromo-Lithograph, Plate 1, Fig. 5.) This, however, is wrong and such cases should be diagnosed as *ulcus corneæ cum hypopyon*. True hypopyon keratitis is a much more serious condition than the preceding, as shown by the fact that formerly many eyes were completely lost from this disease. In the clinic of Schmidt-Rimpler\* the proportion of disastrous cases being as high as 19.2 per cent. The progressive course of this ulcer, from which it derives the name of serpiginous, is by infection. Its infectious origin is proven by the fact that it may be produced in animals by introducing putrid or fermenting substances into wounds made in the cornea.

**SYMPTOMS AND COURSE.**—In the inflammatory or active cases there is very severe pain and photophobia, with redness of the conjunctiva and some muco-purulent discharge. The ulcer may develop at either the margin or the centre of the cornea as a slight loss of substance, usually oblong in shape, its base appears

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\*Lucanus, "Ulcus Corneæ Serpens," inaug. dissert, Marburg, 1882.



grayish, its edges raised and mottled or streaked with white. In the very early stage careful examination shows a deposit upon the membrane of Descemet, giving the base of the ulcer an appearance as though coated with mud, and often a small quantity of pus may be seen in the bottom of the anterior chamber. The hypopyon increases as the ulcer spreads and gives the base of the ulcer a yellow color, as though due to suppurating corneal tissue. The rapidity of the ulceration is such that the entire cornea may be eaten away in two or three days. The ulcer always extends from its border, steadily and rapidly, either directly across, or around the entire cornea. In this way the nourishment of the cornea is cut off and slough of the entire cornea may ensue. Increase in the amount of the hypopyon is always an evidence that the destruction of the cornea is still going on. When a large perforation takes place, allowing of the escape of the hypopyon, repair may then set in. In the early stages of this disease there is usually excessive pain, but later on, owing to the cutting off of the corneal nerves by the ulceration, pain may be wholly absent. The disease may occasionally make its appearance in a far less acute attack, in which the inflammatory symptoms and pain may be so moderate that the subject will allow the condition to go on for several days before seeking advice, when we may find a considerable portion of the cornea affected, and the anterior chamber may be half full of pus. On watching these cases two processes may sometimes be seen going on at the same time, viz.: An extension of the destruction at one extremity of the ulceration and repair at the other end or seat of original infection.

*Hypopyon.*—The occurrence of pus in the anterior chamber may be accounted for in several ways, viz : by direct passage through the corneal canals, which communicate in the ligamentum pectinatum (through Fontana's canals) with the contents of the anterior chamber; in cases where the abscess or ulcer is deep and near Descemet's membrane it becomes affected together with the endothelial layer, the cells of which proliferate, become detached and fall into the anterior chamber; again, if the ulcer or abscess is situated near the corneo-scleral margin, the iris and ciliary body may become inflamed and through this inflammation hypopyon may form. Verdese\* made a microscopic examination of an eye af-

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\* Ann. di Ottalm., vol. xvii, 1, p. 67.

fectured with hypopyon keratitis in its incipency and found a small rupture of Descemet's membrane. The ulcer had penetrated but one-third of the thickness of the cornea, but the layers beneath were infiltrated with leucocytes and otherwise unaltered; the iris was normal. From this he concludes that hypopyon is due to a bursting of Descemet's membrane and the entrance of leucocytes from the ulcer.

CAUSES.—Being due to infection, it is most generally found in the poorer classes, where, from want of care, decomposed matter is allowed to sojourn in the conjunctival sac. Leber\* attributes the cause to a fungus, which enters the cornea through some loss of the epithelium. This fungus he believes to be present in the air during the harvest season and secures lodgment in the secretions of a catarrhal inflammation of the conjunctiva or lachrymal sac. In the better classes the septic material is usually the outcome of an inflamed lachrymal sac, the secretion being retained and decomposed. Any abrasion from chips of stone or metal, or simple epiphora, by maceration of the epithelium, gives an opportunity for the infection. The disease nearly always occurs in adults over forty years of age.

TREATMENT.—For many years the treatment of this disease was the *bête noire* of all ophthalmic surgeons. Local and medical measures seemed to fail, iridectomy and paracentesis were tried without avail, when Sæmisch advised the slitting up of the ulcer, and to him is due the credit of suggesting the operation which is to-day most generally employed. Of late years the use of the actual cautery, or of either the galvano or thermo-cautery, has to some extent supplanted or been used together with, the Sæmisch operation. My own preference is for the galvano-cautery loop, and since its use I have seldom resorted to the knife. Gruening\* advises using the point of a delicate platinum probe, brought to a red heat in a spirit lamp, held behind the patient. The lids are separated and the eye steadied by the fingers of the left hand of the operator, while with the right hand the red hot point is applied to the arc or zone of propagation. The eye having been previously cocainized, the patient suffers no pain. Under the compress bandage the eschar is thrown off in twenty-four hours,

\* Archiv. Ophthal., vol. xiv., 1, 1885.

† Von Graefe's Archiv., xxv., pt. II, p. 285.

leaving a clean ulcer which heals rapidly. He advises in the more advanced stages of the disease, where the floor of the ulcer is thin and infiltrated and the anterior chamber partly filled with septic material, that the actual cautery be combined with Sæmisch's operation; the cautery destroying the septic material of the cornea, while the Sæmisch incision removes the septic material from the anterior chamber. The operation of Sæmisch and other treatment, both local and medical, will be found under treatment *Ulcus Corneæ*, page 246.

**Ulcus Rodens.**—The rodent ulcer unlike the *ulcus serpens* runs a very slow chronic course, often lasting for months, and affects only the superficial layers of the cornea. It appears as a small gray infiltration near the corneal margin which ulcerates, and when appearing to heal, relapses set in and more tissue is involved until it has extended over the entire cornea. It is accompanied by decided irritation, pain, photophobia, lachrymation and ciliary injection. The disease usually involves both eyes, occurs in debilitated people past middle life, and as it eats away the whole surface of the cornea results in complete loss of sight.

**TREATMENT.**—The cautery should be used to arrest the disease. Atropine and the bandage are of service to relieve the pain. For remedies, see *Ulcus Corneæ*, page 248.

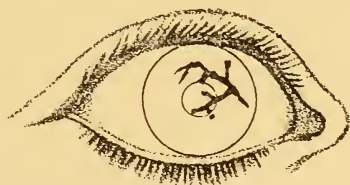
**Asthenic Ulcer.**—(*Absorption Ulcer, Non-Inflammatory or Clear Ulcer*).—This form of ulceration differs, as its names imply, somewhat from those already described, and hence is briefly mentioned. It is but rarely seen, generally appears suddenly and most often in the central part of the cornea. The edges are jagged and outlines irregular, though more or less circular. The depth of the ulcer is often deceptive, owing to the bulging forward of its thin base (*keratocele*). This ulcer may remain stationary for weeks or months, then the edges may become vascular, the margins rounded off and the loss of substance be restored. Repair is often more or less incomplete and a slight facet may remain. It is usually found in adults and sometimes is seen symmetrically in both eyes and may go on to perforation. There is no infiltration either at the base or margins of the ulcer and no pericorneal injection. The only subjective symptom is more or less interference with vision, according to its site.

**TREATMENT.**—Warm applications and a compress bandage may be applied and local irritants may be used to stimulate the ulcer. For remedies, see indications under *Ulcus Corneæ*, especially *Con.*, *Kali bich.* and *Nux vom.*

**Marginal Ring Ulcer.**—Is a deep, clear cut ulcer occurring at the corneal margin. There is but very slight infiltration and it may extend all around the cornea, causing a slough by cutting off the nutrition of the cornea. Healing may occur at one extremity while it is extending at the other. It is a very rare form of ulcer, occurring usually in adults or old people whose nutrition has fallen very low, but may occur in children from a marginal phlyctenular infiltration.

**Keratitis Dendritica** (*Malarial, Mycotic and Furrow Keratitis*).—Under these various headings have been described a super-

FIG. 64.



Malarial keratitis (Kipp).

ficial ulceration of the cornea, all of which have the one general appearance of narrow furrows with offshoots or ramifications which follow a crooked or zigzag course over the cornea (Fig. 64). In these cases there may be very intense photophobia, lachrymation and neuralgic pains in the eye, with but little inflammation or infiltration. It is generally considered to be due to some particular microbe and is apt to be rather chronic in its course. Emmert\* found in two cases a peculiar bacillus in or on the epithelial cells. Kipp† describes the disease as malarial keratitis, and claims that, out of 120 cases that he had seen, all but about twelve were suffering from malarial poisoning.

**TREATMENT.**—Scraping the bottom of the ulcer with a sharp

\* Hirschberg's *Centralblatt für Augenheilkunde*, October, 1885.

† *Trans. Amer. Ophthal. Soc.*, 1889, p. 331.



spoon and the local use of a  $\frac{1}{1000}$  solution of corrosive sublimate has proven of decided value in this form of ulceration. Ipecac., Conium and Hepar. have been the most serviceable remedies in my hands.

**Keratitis Neuro-Paralytica.**—The cause of this fortunately rare disease is a paralysis of the ophthalmic division of the fifth nerve, which results in a loss of sensibility of both the cornea and conjunctiva, thus allowing external irritants which, under normal conditions, are rapidly removed by winking, to remain in contact with the cornea and create a traumatic inflammation. It is further claimed by some that the paralysis also causes an interference with the trophic fibres which preside over the nutrition of the cornea. The cornea becomes dull and cloudy; the epithelium of nearly the entire cornea is thrown off. The cloudiness of the cornea at its centre increases, breaks down into pus and a large ulcer with hypopyon is formed. The course of the disease is slow and characterized by absence of pain and slight symptoms of irritation. The paralysis of the nerve may result from injury, tumors, syphilis, etc.

The *prognosis* in all these cases is necessarily bad, as dense opacities form over the entire cornea.

**TREATMENT** should be to protect the eye from external irritants; hence, a compress bandage should be applied. The use of electricity to stimulate the nutrition of the nerve is of great value. Otherwise, the treatment should be that of ulcers in general. Sepia has given very excellent results in this disease. (Shepard.)

**Keratitis Bullosa.**—This is characterized by an elevation of the epithelium, and, according to Landesberg,\* of some of the corneal layers as well, from an effusion of slightly cloudy fluid. The elevation is of considerable size and of a sacciform appearance. Its approach is accompanied by a severe attack of peri-orbital neuralgia, photophobia and acute congestion of the eye. After a few days rupture of the bullæ takes place and a more or less deep ulceration remains, which finally heals as described under ulcers. The pain in this affection is usually very severe, paroxysmal in character and ceases after the breaking of the covering. The disease usually follows upon other diseases of the eye, such as glau-

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\* Archiv. Ophthal and Otol., vol. vi., p. 135, 1877.

coma and irido-cyclitis. There seems to be a tendency to recurrence of these attacks, and, from this fact, together with a case seen by Tangeman,\* in which there was distinct malarial history, with a cure from large doses of quinine, he suggests the possibility of its cause being malaria. Fick says: "The nature of the disease is not known; the best presumption is that some disease of the corneal nerves is at the bottom of it."

**TREATMENT.**—To relieve the pain, remove the envelope of the bullæ and then treat as an ordinary ulcer.

**Abscessus Corneæ.**—By corneal abscess we mean a circumscribed collection of pus within the layers of the cornea.

**PATHOLOGY AND COURSE.**—There is at first an infiltration of round cells into the corneal tissue. The pressure from these cells upon the parenchyma of the cornea causes a mortification and fatty degeneration of the parts involved, and thus a pus cavity is formed which is generally the shape of a flattened globe or ovoid. Trabeculæ are sometimes found extending from one wall to the other. The cavity is filled with round cells and a fatty, cheesy detritus. The surrounding corneal tissue is also infiltrated. The abscess *may* heal at this stage without further destruction. If so, it begins by the formation of new blood-vessels, the cells and detritus become absorbed and the walls of the cavity heal together; or the cavity may be partially or totally filled with connective tissue, and then the blood-vessels either atrophy and disappear or remain persistent. As a rule, however, the abscess does not heal at this stage, but, instead, more cells immigrate and are at the same time formed within the cavity and thus more and more of the parenchyma is destroyed. This ulceration usually extends until the outer surface is reached and an ulcer is formed. More rarely the destructive process extends inward, through Descemet's membrane, into the anterior chamber. Lastly, the abscess frequently extends in both directions at the same time and results in perforation of the cornea, with an escape of the aqueous and hypopyon, and a prolapse of the iris takes place. The further progress of the disease from this point has been described under ulcers.

**SYMPTOMS.**—The beginning of this affection is in the deeper layers and usually at about the centre of the cornea. There appears a round, circumscribed, gray opacity, in which may be seen

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\* Archiv. Ophthalm., vol. xvii, p. 92, 1888.

short, gray striæ. The surface of the cornea over the abscess may be slightly raised at first, but later it becomes sunken in, simply depressed not ulcerated. Photophobia, lachrymation and ciliary neuralgia are, as a rule, very severe. There are usually violent symptoms of irritation, such as intense injection of the conjunctival and ciliary vessels, chemosis even is very apt to be present. The pupils are contracted, iritis is apt to be present, and hypopyon is usually found. The disease as a rule is a most painful one; the terrible pains often radiate to the occiput and teeth, causing sleepless nights, etc.; in fact, in some cases, the pain seems to equal that of acute glaucoma or cyclitis. The intense pain is evidently occasioned by implication of the uveal tract and coincides with the appearance of hypopyon. Very rarely we will meet cases of torpid abscess with but slight symptoms of irritation. Sometimes there are several superficial infiltrations close to each other, which may extend in circumference and depth, coalesce and give rise to a large abscess which may leave a dense opacity or lead to an extensive slough of the cornea. The disease usually shows a tendency to extend in depth rather than breadth. Relapses may occur and the affection thus becomes chronic in character.

CAUSES.—An abscess originates by infection, usually by some slight abrasion of the epithelium, as from the scratch of a fingernail, from a branch or leaf striking the cornea, or from any foreign bodies flying into the eye. The pyogenic organisms that cause the suppurative process may arise from the substance that causes the abrasion, or may be present in the conjunctival sac, due to catarrh, trachoma or blenorrhœa of the lachrymal sac. This form of abscess occurs almost exclusively in adults of the laboring class. The infection may also occur through metastasis, from the germs circulating in the blood, as in smallpox, typhus, scarlet fever, etc. Metastatic abscesses may be found in children as well as adults.

PROGNOSIS is, as a rule, unfavorable, as a permanent opacity, more or less extensive, always remains. Where there has been no perforation, the convexity may appear normal; but after the escape of the aqueous, we may have any of the conditions following perforation as described under ulcers.

TREATMENT.—(See *Ulcus Corneæ*, page 246).

**Descemetitis** (*Keratitis Punctata*, *Keratitis Posterior*).—An inflammation of the membrane of Descemet pure and simple is of rare occurrence. This disease is most frequently described as a *punctate keratitis* and the whole subject is so thoroughly mixed up with serous iritis in ophthalmological literature that a clear understanding of the two conditions is somewhat difficult. (See *Choroiditis Serosa*.)

**SYMPTOMS.**—Pain, photophobia, lachrymation, ciliary injection, dilatation of pupil and hypersecretion of aqueous humor are all of a low degree, and may or may not be present. There is, however, on the *posterior surface of the cornea more or less numerous small, grayish or dirty-white points*, especially found over the pupil. These points may extend into the parenchyma and may result in a sclerosis of that tissue. Its course is always long-lasting and obstinate to treatment. It has a great tendency to recur, and periodical aggravations are frequent.

**CAUSES.**—Women seem to be more subject to this affection than are men or children. It is often ascribed to some constitutional dyscrasia, such as syphilis, scrofula, etc. The condition described is very frequently associated with a serous inflammation of the iris or uveal tract, still I am convinced that it can occur primarily.

**PROGNOSIS.**—Entire recovery may take place and the cornea resume its normal characteristics, or the opaque spots may remain permanent, and especially so if the cornea proper has been involved.

**DIAGNOSIS.**—As this disease so closely resembles serous iritis, we will contrast the differential diagnostic points:

Descemetitis.	Iritis Serosa.
<p>May occur alone.</p> <p>Hypersecretion of aqueous with little if any cloudiness. Punctate spots on the posterior surface of the cornea, which are not triangular in shape, do not change position on movement of the head, but are permanent and more often at the centre of the cornea over the pupil. Anterior chamber normal. No discoloration of iris. Tension is not increased.</p>	<p>Usually follows upon some intra-ocular inflammation.</p> <p>Hypersecretion of aqueous, which is cloudy. Deposits of lymph on the posterior surface of the cornea, taking a pyramidal shape, with the base at the lowest point, changing with the position of the head, and due to gravity. Anterior chamber deeper. Iris somewhat discolored. Tension may be slightly increased.</p>



**TREATMENT.**—The patient should be ordered a good, plain, nourishing diet, together with plenty of exercise in the open air. The eyes may be protected with smoked glasses when there is much photophobia. The chief dependence is upon the use of the homeopathic remedy. *Kali bich.* has proven in our hands to be the remedy in this disease. Others, such as Gels., Aurum, Calc., Conium, Ars., Hep. and Merc., may be of service. For special indications refer to keratitis and iritis.

**Keratitis Parenchymatosa** (*Keratitis Interstitialis, Diffusa, Profunda, Syphilitic*).

**PATHOLOGY.**—In this form of keratitis there is first an infiltration of round cells into the affected portion of the cornea, with a little later, proliferation of the corneal fixed cells. The infiltration is usually in the innermost layers of the corneal lamellæ, and when confined there, the epithelium remains unaltered; but if the outer layers, adjoining Bowman's membrane, become involved, the epithelium becomes irregular, thickened and loses its normal lustre and smoothness. This infiltration usually heals by absorption, either with or without the formation of new blood-vessels, which, when present, disappear during the process of recovery, except in rare cases. When absorption does not take place, the infiltration produces sclerosis of the involved part, which is the result of new formation of translucent connective tissue between the normal transparent lamellæ with subsequent obliteration of the corneal canals.

**SYMPTOMS.**—The characteristic appearance of the cornea is that of a deep seated grayish opacity, accompanied by slight injection of the ciliary vessels. The opacity usually commences at the periphery of the cornea, and gradually extends concentrically from all sides toward the centre, or it may advance by sending in processes which afterward become confluent. In other cases the centre is first affected by small, dim gray maculæ, which increase in number and extend further and further toward the margin, but are always massed most thickly in the centre where they frequently become confluent. The density of the infiltration is apt to vary in different portions of the cornea, but is always thickest at the centre over the pupil. The cornea is frequently so opaque that the iris is quite invisible. The color of the opacity also depends

upon its density, assuming a decidedly yellow hue at the thickest part and from that shading to white at the thinner spots. (See Chromo-Lithograph, Plate 1, Fig. 6.) The extent of the irritation and inflammation varies so much in this disease that some authors speak of it as of two forms—the vascular and non-vascular—but as the amount of the inflammation is the only distinguishing feature of the two varieties, we shall consider it simply as one disease.

We find the majority of the cases of the disease without any vascularity of the cornea and occasionally without any congestion of the conjunctiva; but, as a rule, there is more or less pericorneal injection together with photophobia, lachrymation and pain, which are usually more pronounced the greater the amount of vascularization.

Occasionally the vascularity of the cornea will be so great that the appearance will be that of an extravasation of blood into the corneal layers. As the opacity clears up, these new vessels gradually disappear. The vision is always impaired if the centre of the cornea is involved and often to such an extent that only shadows are discernible. Parenchymatous keratitis is generally complicated with inflammation of the uveal tract, in severe cases iritis and choroiditis is nearly always present.

COURSE.—Both eyes are usually affected in this disease, commencing generally in one eye first, and when this is well advanced the second will become inflamed, or sometimes the second eye will not be involved until long after the first has recovered.

The course of the disease is very slow and protracted; in fact, it may last from three months to as many years, although as a rule the majority of cases will recover in from two to ten months. In most cases the infiltration will seem to steadily increase, regardless of all treatment, for one to three months before it reaches its height, where it will seem to remain nearly stationary for a short period and then begin gradually to clear up from the margin, the central portion over the pupil being the last to clear.

CAUSES.—It is more frequently found in girls than in boys and from the fifth to the twentieth year, and is more often met with in feeble, delicate children, due, perhaps, to want and privation, or from close confinement in a vitiated atmosphere. The most frequent predisposing cause is inherited syphilis or scrofula, and

some authors attribute as high as 90 per cent. of the cases to these causes. It is certainly the fact that in the large majority of cases of parenchymatous keratitis, if the teeth are examined, one can find the deformities to which attention was first called by Mr. Jonathan Hutchinson and by him considered a manifestation of inherited syphilis. The so-called Hutchinson teeth consist essentially of a single broad notch in the cutting-edge of the tooth, especially found in the upper central incisors, and in addition to this characteristic peculiarity they will sometimes diverge or slant toward each other. In addition to the teeth we should always look for other evidences of inherited syphilis. The child is apt to be thin, anæmic and of stunted growth, with flat nose, cicatrices at the angles of the mouth, and often more or less deaf.

PROGNOSIS.—In the majority of cases the recovery will be nearly or entirely complete; that is, the haziness will disappear and vision will be restored to normal or nearly so. In view of the possibility of incomplete clearing of the cornea the prognosis should always be guarded as to the ultimate amount of vision. Cases accompanied by vascularity of the cornea are less favorable than those where no vessels appear in the cornea. Where the disease is complicated by inflammation of some of the adjoining tissues of the eye the prognosis should be more guarded, dependent upon the existing disease.

COMPLICATIONS.—There is a great tendency of the iris to become inflamed, and when it is, it is often overlooked on account of the haziness of the cornea. Cyclitis is a more dangerous but fortunately a less frequent complication. Choroiditis and opacities of the vitreous may also occur as a complication of this disease, while in extremely rare cases shrinking of the cornea and even phthisis of the eyeball have occurred. An extension of the inflammatory process would be suspected if there was noticed an increased vascularity, lachrymation, photophobia and ciliary neuralgia, if the sight should be diminished more than the opacity of the cornea would indicate and if the field of vision became contracted and the eye sensitive to touch.

TREATMENT.—In a large majority of cases the use of the homœopathic remedy is all sufficient and gives decidedly better results than any other mode of treatment. Here homœopathy shows its great advantage over the old school, for we can often check

the progress of the disease in a speedy manner by the careful selection and administration of our drugs.

As the disease is nearly always found in those of an enfeebled, debilitated constitution, the diet should be nutritious and easily digestible, while the use of tonics and stimulants may be advisable. The eye should be protected from the light and wind. During repair fresh air and out-door exercise should be advised. In those cases where the infiltration is so dense that the iris cannot readily be watched, *Atropine* should be instilled to prevent involvement of the iris. In some extremely indolent cases good effect is obtained from the use of the *yellow precipitate* ointment or the dusting of the eye with powdered calomel. Hot fomentations have sometimes seemed beneficial in causing the development of new blood-vessels to hasten the absorption, and also in preventing the lymphoid infiltration.

In regard to remedies the following have proven of the greatest value in this disease:

**Aurum mur.**—The muriate of gold has been most commonly used, and in the lower potencies. It is especially important in all those cases in which the cause can be traced to *hereditary syphilis*, and as the majority of cases of genuine interstitial keratitis are of this origin, it can readily be seen how common a remedy this may be. We have seen it act speedily and permanently in both the vascular and non-vascular variety of the disease. The subjective symptoms are not prominent and may be absent, though usually there is some photophobia, irritable condition of the eye and dull pain in and around the eye, which often seems deep in the bone.

**Cannabis sat.**—Interstitial inflammation of the cornea from hereditary syphilis. Cornea densely opaque and *vascular*. The photophobia is intense, and lachrymation profuse.

**Hepar.**—Keratitis parenchymatosa in scrofulous subjects. Cornea opaque and vascular, with deep ciliary injection, severe iritic pains, excessive photophobia, profuse lachrymation and great sensitiveness of the eyeball to touch. Of service in clearing the cornea after the inflammatory process has been checked.

**Mercurius sol.**—Especially indicated if the cause can be traced to either acquired or hereditary syphilis. The ciliary injection, pain and iritic complication are well marked, as well as the nocturnal aggravation and general concomitant symptoms. The inflammation is more active than under Aurum.



**Calcarea phos.**—Parenchymatous inflammation of the cornea of strumous origin. The infiltration into the cornea may be dense. Photophobia is usually present. Enlargement of the tonsils and other Calcareo symptoms will be found.

**Arsenicum.**—Interstitial keratitis, cornea hazy with commencing vascularity. *Intense photophobia and profuse lachrymation, with burning pain in and around the eye, worse after midnight.*

**Apis.**—Cornea densely infiltrated, with moderate redness and photophobia. History of hereditary syphilis, with exostoses, swelling of the joints, high fever, drowsiness and thirstlessness may be present.

**Baryta iod.**—Interstitial keratitis occurring in scrofulous subjects, *with great enlargement of the cervical glands*, which are hard and painful on pressure.

**Kali mur.**—Diffuse infiltration of the cornea, with some pain, moderate photophobia and redness.

**Sepia.**—Keratitis parenchymatosa complicated with uterine disturbances.

**Sulphur.**—Indicated in strumous subjects, even if the inflammation is in an active stage. Especially useful, however, in promoting the absorption of the infiltration into the cornea, after the inflammation has been allayed by proper remedies.

Other preparations of Calcareo, Kali and Mercurius may prove of service in the treatment of this disease.

**Opacities of the Cornea.**—These are often classified according to their density as leucoma, macula, nebula, etc.—the leucoma being the most dense or non-transparent. This sub-division is of no exact value or practical importance, as the impairment in vision will be oftentimes surprisingly great from an almost imperceptible nebula over the pupil, while a dense leucoma at the periphery of the cornea will cause no loss of vision. Very sharp, careful scrutiny of the cornea with the oblique illumination is often necessary to recognize a very faint opacity, which may be the cause of more or less loss of vision. We have frequently seen our students make a protracted examination of an eye both with glasses and with the ophthalmoscope in order to determine the cause of the impaired vision, which was due to a very faint opacity that had been overlooked. Distant vision is always more affected by a faint opacity than is near vision.

*Congenital Opacity* is sometimes met with, and in these some gradual spontaneous clearing up may be expected.

*Arcus Senilis* or *Gerontoxon* is a light gray arc or oval ring at the periphery of the cornea. It is perfectly smooth and more intense toward the limbus, from which it is separated by a narrow, transparent strip. It appears first above and then below and is due to a deposition of a colloid substance in the more superficial layers of the cornea.

Opacities are most frequently caused by corneal ulcers, which, when recent, are of a gray, dull appearance, but later become smooth and bluish-white. They also may result from deposits of lead or lime in corneal cicatrices. Pannus, inverted eyelashes, etc., cause opacity.

*Sclerosis* of the cornea is another form of opacity resulting from an infiltration of the cornea. It is produced by a damming up of the corneal canals with a dilatation of the lacunæ, and from this pressure upon the corneal tissue its transparency is changed to resemble more the tissue of the sclerotic, and it is sometimes difficult to determine where the sclera ends and the cornea begins. This condition generally results from keratitis, episcleritis, etc.

PROGNOSIS.—In recent opacities a gradual absorption may be expected, especially if occurring in a young subject. Central opacities may cause strabismus, or, if semi-transparent, may simulate myopia, as the patient will hold objects nearer to the eyes in order to obtain a clearer retinal image. Bilateral corneal opacities in young children may cause nystagmus. The prognosis of opacities of the cornea varies according to their duration and character. If they are dependent upon infiltration into the cornea, proper treatment will usually cause their absorption; but if they result from new scar tissue, as in extensive ulceration, the prognosis is not favorable. Time will, however, do considerable in clearing the cornea, especially in the opacities of children.

TREATMENT.—If there is some vascularity of the cornea remaining, which indicates that the opacity is recent, the application of irritants to the cornea to promote the dispersion of opacities is often of great advantage. The following have been found most efficacious and should be applied directly to the opacity: Sulphate of soda, aluminate of copper, bichromate of potash, or carbolic acid and glycerine (gtt. vi. ad ʒj).

In order to cut off the irregularly refracted rays of light in some forms of opacities, stenopaic spectacles, either with or without convex or concave glasses, may be of advantage.

The use of electricity may be of some value to clear up a recent opacity of the cornea.

Various operative procedures have been used in appropriate cases. In an old, dense and large central opacity, an iridectomy opposite a transparent portion of the cornea is frequently advisable. In cases of a deposit upon the cornea from lead, lime or other substances, it may be removed by *scraping* or *excision* of the superficial layers containing the deposit. Oil and a wet compress should then be applied. When the opacity is very dense and disfiguring, it may, for cosmetic effect, be covered by *tattooing* with India ink. In this operation care must be taken not to do too much at one sitting on account of possible disagreeable reaction. The eye is cocainized and the opacity covered with a paste of the finest quality of India ink, a needle or bundle of needles then pricks the epithelium obliquely and forces the ink under the epithelium. Care must be taken that a flow of tears does not spread the ink into any wound of the conjunctiva made by the fixation forceps.

As there is usually a total lack of eye symptoms in these cases, we must chiefly rely upon the general condition of the patient, though the following are the drugs which have been found more commonly indicated: Aurum, *Calc. carb.* and *iod.*, Cannabis, *Cuprum al.*, *Hepar.*, *Kali bichr.*, *Nat. sulph.*, Sil. and Sulphur.

**Staphyloma Corneæ** is a bulging forward of the cornea, either in part or of the whole, and is due to perforation of the cornea with a prolapse of the iris and a large adhesion to the cornea. A central perforation, with no adhesion of the iris, will not cause staphyloma. Total staphylomas result from larger perforations, such as are apt to be found in purulent or diphtheritic conjunctivitis or hypopyon keratitis, while the partial staphyloma is more apt to result in cases of pustular keratitis in children. Staphyloma is directly due to the glaucomatous symptoms resulting from the adhesions of the iris and cornea, which blocks up the filtration passages or excretory channels of the eye. Thus, excretion being partially or totally prevented and secretion constantly going

on, something must give, and the cornea, weakened by inflammatory changes, bulges. The tension in staphyloma is usually slightly increased, and a glaucomatous cupping of the nerve has been demonstrated. A partial staphyloma may increase to an involvement of the entire cornea, or total. When the bulging has increased so as to protrude between the lids, its exposure is apt to produce inflammatory exacerbations, which cause a still greater increase in the staphyloma. Its shape is usually spherical and the sclera or whole anterior part of the eyeball may be involved. The lens may have escaped at the time of the perforation, or, if it remains, is usually cataractous. The appearance of a staphyloma is usually densely white or bluish and with large vessels coursing over it, or it may appear thinner and darker in color.

**TREATMENT.**—In partial staphyloma paracentesis, frequently repeated, may prevent its increasing, although, as a rule, iridectomy, which acts by diminishing the intra-ocular pressure, is better. When complete, and the vision destroyed, our aim should be to improve the appearance and relieve the pain by a removal of the protrusion. This may be done in several ways. *Abscission* is the operation which has given the best results in our hands, and is made after the method proposed by De Wecker\*, who first separates the conjunctiva all around the cornea, nearly back to the equator of the eyeball. Four sutures of different colors are passed through the conjunctiva about three mm. from the margin of the wound. The protrusion is then cut off by transfixing it through the middle, and cutting outward, then seizing the end of the flap thus formed and removing the rest with scissors. The sutures are then tied and the eye closed without much loss of its contents or risk of bleeding. This operation is preferable to enucleation, because it furnishes a much better stump for the wearing of an artificial eye. The objections to it are the danger of setting up a severe inflammatory reaction or of causing a sympathetic inflammation of the other eye. It therefore, perhaps, should not be made where the staphyloma is subject to inflammatory attacks or where the other eye shows any evidence of sympathetic irritation.

*Enucleation of the Eye.*—In this operation a pair of curved blunt-pointed scissors, speculum, fixation forceps and a squint

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\* *Chirurgie Oculaire*, p. 188.



hook are necessary. An anæsthetic should always be used, unless some general condition renders it dangerous. The conjunctiva is to be separated from the globe close to the cornea all around, and the capsule of Tenon dissected back. Then the superior rectus muscle is taken up on the squint hook and severed close to the globe; the other recti muscles may be divided as most convenient, and it is my practice to pick up and sever the obliques before cutting the optic nerve. Many operators, however, prefer to extrude the eye from the orbit by pressing between it and the orbital rim, then dividing the nerve and oblique muscles afterward. To divide the optic nerve the scissors should be inserted closed at the inner side and pushed back until coming in contact with it, when the blades are opened and the nerve severed. The eye should then be pushed forward with the scissors and the numerous small bands of adhesion, which are usually found cut away. Immediately after cutting the nerve more or less hæmorrhage is apt to occur, but usually is readily controlled, after which a thorough irrigation of the cavity with a 1-5000 solution of corrosive sublimate should be employed and *firm, tight* compress bandage applied.

*Evisceration or Exenteration* of the eye, as removal of its contents is called, is done by excising the cornea at the limbus and removing the entire contents of the globe down to the sclerotic, either with a spatula, or, as performed by the late Dr. Liebold, with balls of picked lint, wiping out the vitreous, retina and choroid until perfectly clean. The cavity is thoroughly irrigated with a 1-5000 bi-chloride solution and the scleral wound drawn together with sutures. This operation has been highly commended of late years by Alfred Graefe, Bunge and others as a substitute for enucleation, but to Liebold should belong the credit of having first practiced it. The principal value of this operation over enucleation is that it leaves a larger and better stump for the wearing of an artificial eye.

*Artificial Eyes* are made of both glass and celluloid and are of various sizes and colors. The eye should not be worn until from six to eight weeks after the removal of the globe, and then not worn continuously at first and always should be removed at night. The insertion of an eye is very easy and readily acquired by the patient. It is to be pushed beneath the upper lid and held there

while the lower lid is brought over its lower edge. In its removal the lower lid is depressed and a probe inserted beneath the eye, which is brought forward and slips out from its own weight.

**Keratoconus** (*Cornea Conica*, *Staphyloma Pellucidum*).—Conical cornea is easily overlooked when but slight. In a marked case we notice that the centre of the cornea appears unusually bright and glistening, as though from a tear drop; but from a side view a decided prominence is at once seen. The conicity is usually in the centre, but may be found at the margin of the cornea. On examination with the ophthalmoscope by the direct method there is seen a central bright red spot, surrounding which is a dark zone, and again outside of this a red ring. The dark zone is due to a diffusion and reflection of the light at the base of the cone. The vessels of the fundus appear distorted and broken and the optic disc seems elongated—due to irregular refraction. The vision is often greatly impaired, even in the slightest cases, owing to the eye having become myopic from lengthening of the anterior-posterior axis and from the astigmatism caused by the irregular curvature of the cornea. This astigmatism is too irregular to be corrected with glasses. The bulging is due to a thinning or diminution in the power of resistance of the cornea. It is non-inflammatory and probably results from atrophy or some degenerative change in the corneal tissue, especially at its centre, so that it yields to the normal intra-ocular tension. Tweedy\* believes that there may be some congenital weakness of the centre of the cornea. The condition usually commences between the ages of ten and thirty, generally attacks both eyes and is most often found in delicate people. Its course is very slow and may become stationary at any point. Often the apex of the conical cornea is more or less opaque.

**TREATMENT.**—Glasses, either spherical or cylindrical, will usually give but little improvement, although, when they do, they should be used. Stenopaic aperture or slit may sometimes be added with some further improvement in the vision. Operations of various kinds have been tried with more or less success. When there is a central opacity of the cone, an iridectomy will often be

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\* Trans. Ophthal. Soc. Un. K., Vol. XII, p. 67.

of value. Despagne\* recommends the excision of a crescentic bit of the cornea. The use of the galvano-cautery has been tried in numerous cases and will benefit in some. We have seen a case treated by Dr. Knapp with decided flattening of the conicity and some improvement of vision. He applies an electrode of about the size of the head of a pin to the apex of the cone and burns away a portion of the external surface of the cornea. Under antiseptic dressings there is but little reaction and the resulting opacity is but slight.

The progress of conical cornea can often be checked by the employment of the proper homœopathic remedy, though it is impossible to diminish the conicity of the cornea without instrumental interference.

The remedy must be chosen according to both local and constitutional symptoms, though *Calc. iod.*, *Eserine* and *Pulsat.* have thus far proved most serviceable. Suitable hygienic measures are of great importance, as this affection may be dependent upon a debilitated condition of the health. A pressure bandage may sometimes be used with advantage.

**Keratoglobus** (*Hydrops of the Anterior Chamber, Globular Cornea*). In this disease there is a general spherical distension of the cornea in all its diameters. The sclerotic is often involved in the same process. Sometimes the protrusion becomes so great as to extend between the lids, which cannot close over it, giving a peculiarly staring appearance to the eye (*buphthalmos*). In *buphthalmos* the cornea may either remain transparent or become opaque. The sclera is thinned and of a bluish tint, due to the shining through of the choroid. The anterior chamber increases in depth and circumference, and the aqueous remains clear. The iris is enlarged, stretched and somewhat tremulous from lack of support; the pupil is dilated and sluggish. The iris may be bulged forward or cupped back. Vision is usually greatly impaired. The disease is fortunately quite rare and its treatment of but little value. The use of *Eserine* and the compress bandage in the early stages may somewhat tend to check its progress. Iridectomy may also be of some value, and in advanced cases, the operations for staphyloma may be needed.

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\* Soc. d. Opht. de Paris, November 4, 1890.

**Injuries of the Cornea from Foreign Bodies**, such as chips of iron, steel, wood, glass, etc., are of very frequent occurrence. When imbedded in the cornea they generally excite considerable reaction—the eye becomes red and painful, there is photophobia and lachrymation and the pupil may be somewhat contracted. They are as a rule readily seen, but in some cases of very small particles it is with difficulty that they can be recognized even with the use of an oblique illumination and of atropine to give a dark background. They may set up an inflammation of the cornea or even the iris, and, in old, enfeebled subjects, may result in considerable ulceration or slough of the cornea. Again, they may cause no irritation. Knapp reports a piece of steel imbedded in the cornea for two years without causing any irritation.

**TREATMENT.**—Foreign bodies in the cornea can usually be easily removed, after the instillation of cocaine, by the aid of a gouge without fixation of the eye, though if the patient be very nervous and the foreign body be deeply imbedded in the cornea it is better to use a stop speculum and fix the eye with a pair of forceps or employ an anæsthetic. If the foreign body has penetrated the cornea and lies partly in the anterior chamber, a broad needle should be introduced behind it in order to prevent its being pushed backward in the attempt to extract it. Pieces of steel may often be removed with a magnet. After the removal, if much inflammation, use Acon. and cold compresses.

*Injuries from Lime, Lead and Chemical Agents* are apt to cause more or less extensive sloughing of the cornea. The conjunctiva is usually affected, together with the cornea, and their treatment has already been referred to under the conjunctiva.

**Wounds of the Cornea.**—Small, clean cuts or perforations usually soon heal, with no trace of the injury remaining. The chief danger of penetrating wounds of the cornea is from injury or prolapse of the iris, or from injury to the lens, and, from either of these accidents, lead to a general inflammation of the whole eye (panophthalmitis). Bruises are very apt to excite suppuration.

**TREATMENT.**—The treatment of wounds of the cornea varies according to the complications which may arise. Our first endeavor should be to subdue the inflammatory symptoms, if seen early, by the use of *ice bags*; especially is this true if the iris and other tissues have also been injured, Cold compresses of *Aconite*,



Arnica, Calendula or Hamamelis may be employed locally; at the same time administering one or another, *usually Aconite*, internally. *Atropine* should be instilled into the eye if the injury is near the centre of the cornea or if the iris is involved. If the perforation is near the periphery of the cornea *Eserine* should be substituted for the Atropine. Perfect rest should be insisted upon if the injury is extensive. If a fistulous opening should remain, a compress bandage may be necessary, or even the introduction of a suture.

**Tumors of the Cornea.**—Various forms of tumors, such as dermoid cysts, fibroma, sarcoma, melano-sarcoma, epithelioma, etc., may involve the cornea; but, as their seat primarily is on the conjunctiva, or the deeper structures of the eye, their consideration is taken up in other places. (See *Tumors of the Conjunctiva*.)

## CHAPTER XIII.

## Diseases of the Sclera.

**Anatomy.**—The sclerotic is a dense, tough, fibrous structure, continuous with the cornea, and, by its strength, serves to maintain the form of the eyeball.

Its structure is similar to that of the cornea, excepting that it possesses blood-vessels and its fibres are coarser and less uniformly arranged. It also contains lymph channels, fixed and wandering cells, together with some pigment cells. The thickest portion of the sclera is at the posterior pole and the thinnest just behind the insertion of the muscles. In front it is covered by a loose episcleral connective tissue, and over that by the conjunctiva. Posteriorly, about 2.5 mm. to the inner side of the antero-posterior axis of the globe, it is perforated by the optic nerve, whose sheath joins with the sclera. The place of entrance constitutes a sieve-like perforation called the lamina cribrosa. Surrounding the optic nerve the sclera is perforated by blood-vessels and nerves known as the posterior or short ciliary, which go to the choroid, ciliary body and iris, and in front it is pierced by the anterior ciliary vessels. Near the equator four apertures transmit the *venæ vorticosæ* from the choroid.

**Episcleritis.**—Inflammation of the episcleral tissue may occur alone or with scleritis. It appears as a circumscribed swelling near the edge of the cornea and close to the insertions of the muscles. The bulging is of a dusky red or a dull purple hue. The most frequent situation of episcleritis is over the external rectus muscle, although it may occur at the inner side or either above or below. It may be accompanied by both conjunctival and sub-conjunctival injection, which is apt to be localized. There is usually photophobia, lachrymation and ciliary neuralgia, with some dull heavy pains around the eye.

Episcleritis frequently resembles very closely a large phlyctenule

of the conjunctiva; but overlaying the swelling of episcleritis are seen the conjunctival vessels, which are movable on pressure, while in a phlyctenule the conjunctival vessels do not run over the nodule. Episcleritis has a larger base, its color is darker and shows no tendency to ulceration. The course of an episcleritis is long, usually lasting for weeks and is apt to recur again and again. There is never any ulceration in this disease, as they always disappear by resorption. It is most frequently found in adult females, and has often been found in those of a rheumatic diathesis, and, De Wecker\* says, "especially in the articular form, affecting the knees." A slight cloudiness of the cornea near the elevation of the sclera is sometimes seen. The *prognosis* is unfavorable as to the duration of the disease, but favorable as to the final outcome of vision.

The *treatment* of episcleritis and scleritis are practically the same and will be detailed after a few words upon the latter disease.

**Scleritis** (*Sclerotitis*).—Is an inflammation of the deeper layers of the sclera and is distinguished from an inflammation of the more superficial layers, episcleritis by its tendency to extend to other parts of the eye. This condition appears as a general faint pinkish tint, due to injection of the superficial vessels of the sclera. There may also be present a conjunctival injection, which is distinguished from that of the sclera by being of a deeper red and movable over the pinkish hue of the scleral injection. As the inflammation increases the sclerotic assumes a deeper color—more of a bluish-red tint and sometimes covers the whole circum-corneal region. In the early stages of scleritis it resembles somewhat both iritis and conjunctivitis, and is differentiated from iritis by clearness of the aqueous and absence of adhesions, and from conjunctivitis by absence of secretion. There is apt to be quite severe pain in scleritis and it is undoubtedly of a rheumatic or gouty origin. Females are more subject to this disease than males, and disturbances of menstruation seem to be an exciting cause. Inflammation of the sclera is apt to lead, from ultimate thinning and weakening of its tissue, to staphyloma of the sclera which may be total involving the whole anterior part of the eye, or it may be partial confined to some one section.

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\* Ocular Therapeutics.

As complications of this deep form of scleritis we may have a sclerotizing opacity of the cornea, an iritis or a choroiditis with opacities of the vitreous.

**TREATMENT.**—The local symptoms of this disease being usually few and indefinite, we are often obliged to derive our indications for remedies from the general symptoms of the patient.

If there is great ciliary injection and pain, a solution of Atropine may be employed, but it is rarely necessary.

**Thuja.**—This is a very valuable remedy in all forms of inflammation of the sclera, even if no characteristic symptoms are present. In most instances there has been great tenderness of the globe, intolerance of light and active inflammation, with a general cachectic condition, occurring in persons badly nourished, either scrofulous or syphilitic, and those for a long time deprived of fresh air.

**Sepia.**—Especially indicated in those cases dependent upon or associated with menstrual disturbances. The eyes feel fatigued when using them, a strained dragging sensation in the eyes. Everything gets black before the eyes during menstruation. Sepia cases are always aggravated morning and evening and in hot weather and relieved during the middle of the day.

**Mercurius.**—Inflammation of the sclerotic, which is thinned so that the choroid shines through. *Steady aching pain in the eye all the time, but worse at night;* also usually some pain around the eye, especially if the iris has become involved. Particularly to be thought of if of syphilitic origin. Concomitant symptoms of flabby tongue, offensive breath, night pains, etc., are of great importance. The solubis and corrosivus have been most commonly employed, though the other preparations may be indicated.

**Kalmia.**—Sclero-choroiditis anterior. Sclera inflamed, vitreous filled with opacities, glimmering of light below one eye, especially on reading with the other, were indications present in one case in which Kalmia was of great service.

**Aconite.**—In the acute stage, if there is violent, aching, dragging, tearing, or *burning* pains in the eyeball with contracted pupil, photophobia and the characteristic reddish-blue circle around the cornea. The eye is usually quite *sensitive to touch* and feels *hot and dry*. Especially useful if caused from cold or exposure to dry cold air.



**Aurum.**—Low forms of scleritis in which the infiltration has extended into the parenchyma of the cornea. Moderate pain, redness and photophobia. Syphilitic dyscrasia.

**Cinnabaris.**—Inflammation of the sclera, with *pain over the eye*, usually aggravated at night.

**Nux mosch.**—Nodules over external recti, very large and painful. Patient very drowsy, with sleepy expression of eyes.

**Silicea.**—Sclerotic inflamed, with or without choroidal complication. The pains may be severe and extend from the eyes to the head and are *relieved by warmth*. Aching in the occiput corresponding to the eye affected.

**Terebinth.**—Inflammation of the superficial layers of the sclera, with a considerable redness and *intense pain in the eye and corresponding side of the head*. *Urine dark and scanty*.

The following have also been used and are recommended: *Puls.*, *Spig.*, and *Sulph.*

**Staphyloma Scleræ.**—Bulging of the sclera may be either partial or complete. When partial, it is usually at the ciliary region where the sclera is weakened, because perforated by the venæ vorticosæ and the anterior ciliary vessels; and between the insertion of the muscles, because of less resistance at these points. Staphyloma usually results from an irido-choroiditis, accompanied by an increase of the intra-ocular tension; or, it may result from simply thinning of the sclera from inflammation, *sclerotico-choroiditis anterior*, without increased tension. If its course is very acute, we find conjunctival and sub-conjunctival injection, chemosis and intense ciliary neuralgia. The ciliary region is extremely sensitive to touch, the cornea and aqueous are hazy, the iris discolored and adhered to the lens, the vitreous is clouded with large shreds, tension increased, the vision and field of vision impaired. As the bulging increases it assumes a dusky, dirty-gray or bluish hue, due to the choroid shining through. The progress of the staphyloma is very slow and gradual. The curvature of the sclerotic will first be noticed to be slightly altered after an irido-choroiditis; the protrusion slowly increases, changing its white color for a bluish tint and will often assume a mulberry appearance, due to trabeculæ forming a framework to the darker spots. Inflammatory exacerbations come and go, each time in-

creasing the staphyloma. When the bulging extends all around the sclera it is called *annular* staphyloma, and, when complete, may protrude so far as to be called *buphthalmos*. Total staphyloma can only develop in youth, for in adults the sclera becomes so rigid that it can only bulge in some weakened spot. Both partial and complete staphyloma may remain stationary, go on to atrophy from an inflammation, or, the bulging give way with escape of the contents of the eye, followed by subsequent inflammation and atrophy.

**TREATMENT.**—We should endeavor to prevent this result by the use of those remedies given under scleritis, but if it seems to progress in spite of our remedies, an *iridectomy* must be made.

If the staphyloma has existed for some time, it may be abscised according to one of the various methods advised under staphyloma of the cornea; if it be extensive, and sight is lost, enucleation is to be preferred.

**Sclerotico-Choroiditis Anterior and Posterior.**—As these diseases involve the choroid as well as the sclera their description will be found under the choroid.

**Injuries of the Sclera.**—In penetrating wounds there is diminished tension, and, if extensive, there is usually a prolapse of the iris, ciliary body or vitreous. Wounds accompanied by a prolapse of the iris are especially dangerous from their liability to cause an irido-cyclitis and even sympathetic ophthalmia of the other eye. Wounds further back, causing escape of the vitreous, if slight, may heal without any serious consequences; but, if extensive, may result in inflammatory changes in the choroid, detachment of the retina, or a panophthalmitis with subsequent atrophy of the globe. Rupture of the sclera from a severe blow usually takes place parallel with the cornea and from two to five mm. posterior to it. There is usually a dislocation of the lens, which may be through the rupture and found underneath the conjunctiva, or, if the conjunctiva is also ruptured, it may be expelled wholly from the eye.

**TREATMENT.**—The treatment of wounds of the sclerotic varies according to their extent and situation. If any protrusion of the contents of the globe has occurred, it should be cut off and the

edges of the wound approximated as closely as possible by the aid of a bandage, or the introduction of a fine suture. The patient should be kept quiet in bed and *ice-compresses*, with or without applications of Arnica or Calendula solutions, employed as may be most applicable from the nature of the injury, whether contused or incised. *Aconite* should be given internally.

If the wound, however, is extensive, especially if in the ciliary region, even though the vision is not wholly lost, enucleation is far the safer method of proceeding in order that all danger of sympathetic trouble in the other (healthy) eye may be taken away. In all cases in which a large portion of the globe has escaped and sight is irretrievably lost enucleation is necessary.

If there is a foreign body in the sclerotic it should be removed, but if it has penetrated the sclerotic and is within the eye, it is usually necessary to enucleate, although its extraction may be attempted if there has not been too much injury to the ciliary body. The magnet has, of late, been highly recommended for the removal of steel or iron from the interior of the eyeball.

## CHAPTER XIV.

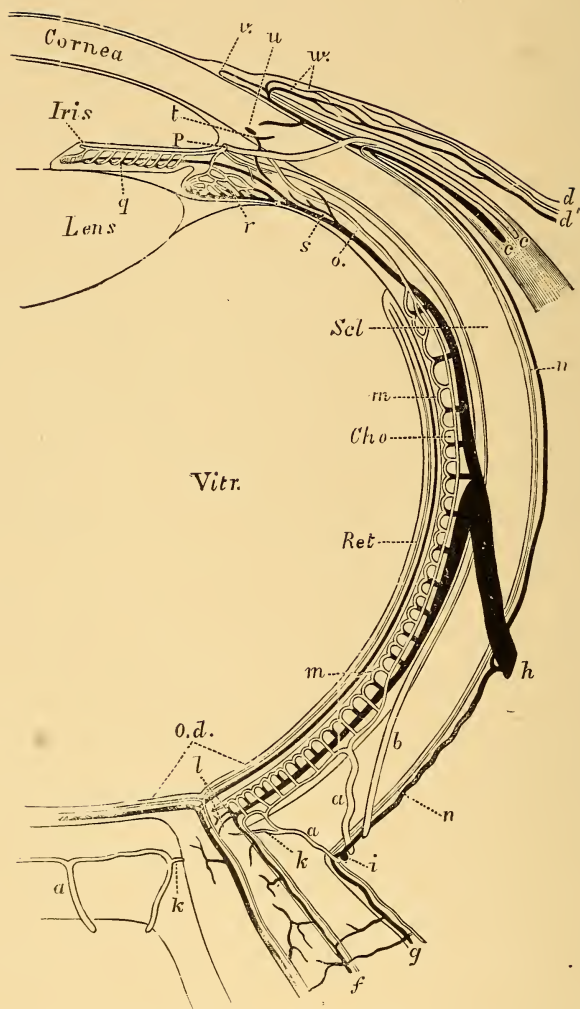
## Diseases of the Iris.

**Anatomy.**—The iris is the beautiful, colored and contractile membrane which is seen through the transparent cornea. It is attached at its periphery to the sclera through the fibres of the ligamentum pectinatum, and is perforated at about its centre by a round opening, the pupil. It rests posteriorly on the capsule of the lens, while its anterior surface is free. The iris is continuous with the ciliary body and choroid, and together they form the vascular tissue of the eye known as the *uveal tract*, which secretes the aqueous humor and nourishes the lens and the vitreous. Between the iris and lens is a circular space known as the posterior chamber, while between the iris and cornea is found the anterior chamber. Both anterior and posterior chambers contain the aqueous humor, in which fluid floats the iris. The anterior surface of the iris is lined with a layer of endothelial cells which is continuous with that on the posterior surface of the cornea. On the back of the iris is a much thicker layer of epithelium containing much pigment and which is continuous with that of the ciliary body and choroid. The *substantia propria* consists of connective tissue fibres and cells, many of which, in dark eyes, contain pigment, and within this stroma are found the muscular fibres, blood-vessels, lymphatics and nerves. The *muscular fibres* are flat, found in bundles, and are of the unstriped variety. Some are arranged in curves about the pupil, nearer the posterior than the anterior surface, and constitute the *sphincter pupillæ*, while others, more deeply situated, run in a radial direction from the centre to the circumference and are called the *dilator pupillæ*.

The blood supply of the iris is derived from the *circulus iridis major*, which is formed by two long posterior ciliary arteries uniting at the ciliary region with the branches of the anterior ciliary arteries, these then give off branches that pass radially toward the pupil, where they form by anastomosis another ring called the *circulus iridis minor* (Fig. 65). Capillary networks are given off



FIG. 65.



Diagrammatic representation of the ocular vessels. The veins are represented black, the arteries clear. *a*, short posterior ciliary arteries; *b*, long posterior ciliary arteries; *cc*, anterior ciliary artery and vein; *dd'*, posterior conjunctival artery and vein; *e'e*, central artery and vein of the retina; *f*, vessels of the internal, and *g*, of the external optic sheath; *h*, venæ vorticosæ; *i*, short posterior ciliary vein; *k*, branch of the posterior short ciliary artery to the optic nerve; *l*, anastomoses of the choroidal and optic nerve vessels; *m*, chorio-capillaris; *n*, episcleral branches; *o*, arteria recurrens choroidalis; *p*, circulus arteriosus iridis major; *q*, vessels of iris; *r*, of the ciliary processes; *s*, branch from the ciliary muscle to the venæ vorticosæ; *u*, circulus venosus; *v*, marginal loop plexus of the cornea; *w*, anterior conjunctival artery and vein.

that terminate in veins, which return the blood in a similar course to that followed by the arteries. The iris contains no lymphatic vessels, the lymph being conveyed in sinuses in the sheaths of blood-vessels. The nerves of the iris are very numerous and follow the same course as the vessels. The action of the pupil is controlled by two antagonistic mechanisms—the sphincter muscle supplied by the third nerve and the dilator muscle, by the sympathetic system. Hence, in division of the third nerve, contraction ceases and dilatation results from the unopposed action of the sympathetic. On the other hand, division of the sympathetic causes contraction from an unopposed action of the third nerve. Stimulation of the third nerve causes contraction by overcoming the dilating action of the sympathetic, and, when the sympathetic is stimulated, any contracting influence of the third nerve is overcome and dilatation follows.

**PHYSIOLOGY.**—The eyes of newly born children are always blue—pigmentation taking place after birth. The iris serves as a curtain to shut off peripheral rays, to regulate the amount of light entering the eye and acts as an aid to accommodation. Contraction of the pupil occurs, from stimulation of the retina by bright light or electricity; when the eyes are accommodated for near vision; in poisoning by morphia, eserine, etc., in deep sleep and after the local application of eserine or other myotics. Dilatation of the pupil occurs when going from a bright into a dim light, when the eye is adjusted for distant vision, in violent muscular efforts, in poisoning by Atropia and other drugs, and after the local application of Atropine or other mydriatics. In examining the mobility of the pupil the eye should be shielded from the light, when a gradual dilatation ensues, then a bright light is suddenly thrown into the eye, when, if normal, the pupil will quickly contract, followed by a very slight dilatation. The pupil is usually larger in children than in adults or old age. Myopes often have large pupils. The pupil is frequently large in nervous, excitable people.

**Hyperæmia Iridis.**—Congestion of the vessels in the iris is frequently a symptom of other irritation or inflammations of the eye. It is met with as a result of the irritation from over use of the eyes or from a foreign body lodged in the cornea. It is also

found in inflammations of other coats of the eye, the cornea, sclera, choroid, etc., and it is, of course, the first change in either a primary or secondary inflammation of the iris itself. It is diagnosed by the ciliary injection, a fine pinkish or rosy zone surrounding the cornea; by a change in the color of the iris, it loses its normal lustre and brilliance becoming of a dull hazy appearance; and by a sluggish contracted pupil, there are no adhesions, but it is simply slow of action. The change in the color of the iris results from the reddish tinge, due to the congestion, which when combined with the normal color of the iris, gives to a blue iris a greenish hue, to the black a reddish brown color, etc.

**Iritis.**—Inflammation of the iris, of whatever form or variety, presents certain characteristic features which are found in varying degrees in the different pathological or clinical classifications of iritis, and hence it is thought best to make a general study of the disease as a whole, with brief allusions to the different subdivisions. There are frequently cases of what might be termed intermediate forms; a serous iritis may change to a plastic; and posterior synechiæ, the diagnostic sign of plastic, may occur in any form.

**PATHOLOGY.**—Iritis may be divided pathologically into three classes, viz.: Plastic, parenchymatous or purulent, and serous. In *plastic* iritis there is first a hyperæmia, followed by an increase of the stroma cells, which become swollen and turbid, together with a fibrinous exudation. This exudation first appears at the pupillary edge and later upon the posterior surface of the iris, but is very rarely found on the anterior surface. The exudation consists of an amorphous, fibrinous coagulum containing some pigment and round cells. The process may be arrested at this period with an absorption of the fibrin. If not arrested at this stage, the fibrinous exudation becomes changed into a delicate membrane, and later into tough, fibrous, connective tissue (containing blood-vessels), which forms the adhesions between the iris and the lens capsule.

In *purulent* iritis the hyperæmia is at once followed by a considerable immigration of round cells and proliferation of the stroma cells. The iris becomes rapidly swollen with an inflammatory product rich in pus cells, which saturates its tissue and overflows into

the anterior chamber. If the disease progresses, all the tissues of the iris become gradually destroyed and the condition is apt to extend, resulting in purulent panophthalmitis.

In *serous* iritis, following the hyperæmia, there is an infiltration of serous fluid and a few cells into the tissue of the iris and upon the surfaces. This serous exudate is glutinous in character and serves to cause adhesions between the iris and lens capsule, but does not contain the cellular elements found in plastic iritis—the adhesions are much less firm. A variety of serous iritis is the *sero-fibrinous iritis*. In this the characteristics are numerous hæmorrhages into the stroma of the iris, the fluid parts of the blood transude into the anterior chamber and the cellular elements remaining in the iris undergo fatty degeneration.

**SYMPTOMS.**—Subjectively ciliary neuralgia is the most characteristic symptom, for in acute iritis the pain is always considerable; it is not confined wholly to the eye, but extends into the forehead and temples as well and frequently patients complain of shooting pains through the whole head. The pain of iritis is always worse at night and in damp weather. It is often increased by cold and relieved by warmth. There is usually but little sensitiveness to pressure, except when complicated by cyclitis. The amount of the pain as a rule indicates the severity of the inflammation, although Fick says lachrymation and photophobia are more trustworthy guides, increasing with the exacerbations of the inflammation and subsiding as the inflammation becomes less severe. In chronic or serous iritis there is sometimes almost complete absence of pain. Photophobia and lachrymation are usually well marked. Dimness of vision will often be complained of, and, when present, may be due to the exudation, cloudiness of the aqueous or to a congestion of the optic nerve or retina.

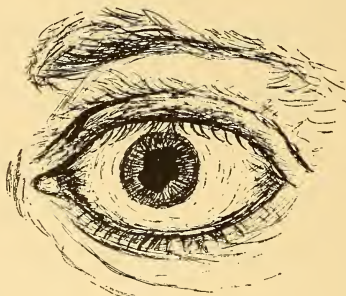
Objectively the lids may be red and puffy, and, on opening the eye, we will find marked ciliary injection, which should always direct one's attention to iritis or some deeper inflammation of the eye. (See Chromo-Lithograph, Plate 1, Fig. 2.) The cornea will appear surrounded by a violet red ring of sub-conjunctival vessels; together with this there is an engorgement of the conjunctival vessels which in some cases amounts to a chemosis.

In the ciliary or sub-conjunctival injection there are numerous very fine, deep vessels extending from the corneal margin in an



almost straight course directly backward and giving the appearance often described as a rosy zone; while in the conjunctival injection the vessels are far less numerous, more superficial, larger and more tortuous in their course. The breadth and intensity of the pericorneal injection is, like the amount of pain, a good indication as to the severity of the iritis. Discoloration of the iris is always present and is due to the addition of the reddish-yellow color, resulting from the congestion and infiltration, to the normal color of the iris; a blue or gray iris changing to a green and a black or brown iris to a reddish-brown color. The iris loses its lustre, assuming a dull, heavy look, instead of its normal, glossy, shining appearance. The pupil is sluggish and contracted. Posterior synechiæ are usually present and are recognized by irregularities of the pupil seen when attempting dilatation with a mydriatic. (Fig. 66.) The pupil may be partially or completely closed by

FIG. 66.



Posterior synechiæ.

the exudation, in this way forming exclusion or occlusion of the pupil. These adhesions or posterior synechiæ form one of the chief and most serious complications of iritis. They interfere with the mobility of the pupil and render subsequent attacks more liable, with greater probability of further adhesions. The haziness of the aqueous is due to the cellular elements thrown off from the iris and suspended in the anterior chamber and may vary from a fine opacity to a hypopyon. A slight increase in intra-ocular tension is sometimes detected. Hyperæmia of the optic nerve is said to be almost invariably present in iritis, but owing to the opacities it can seldom be recognized.

**COURSE.**—Iritis may be either acute or chronic in its course. In the acute variety they run their course in about two to six weeks.

The chronic form of iritis lasts much longer and is apt to be overlooked, as the inflammatory symptoms and pain are very slight and in some cases almost entirely absent. In this form, frequently, the only indications of iritis will be very slight pericorneal redness, lachrymation, dimness of vision and posterior synechia. Recurrent attacks of iritis are very frequent, especially in the syphilitic, and the rheumatic form where other rheumatic affections exist. The tendency to recurrence is greatly increased by the presence of old adhesions.

**CAUSES.**—Iritis is rather rare in childhood, being usually found in adults from the 20th to the 45th year. It may occur in one or both eyes and seems to be found more frequently in men than in women. Scrofula and syphilis are most frequent causes (60 to 75 per cent. of the cases of iritis being due to syphilis alone, according to some authorities). Rheumatism and gout may cause iritis. It may occur after injuries, such as cataract operations, foreign bodies penetrating into the anterior chamber, etc. It may be secondary to other diseases of the eye, especially from the cornea and conjunctiva. Iritis frequently follows after severe constitutional diseases, such as variola, typhoid fever, etc., and is not infrequently seen as a sympathetic affection. It is said to come on from colds and from over-use of the eyes.

**PROGNOSIS.**—This depends upon the stage of the disease and the treatment followed. If iritis is seen early, before adhesions have formed, it should be conducted to a perfect resolution; if, however, posterior synechiæ are present, there will be more or less interference with vision, depending upon the size and strength of the adhesions. Relapses are very apt to occur in iritis, and are rendered more liable when posterior synechiæ remain, owing to the constant traction upon the iris from the adhesions during pupillary movements.

**COMPLICATIONS.**—Corneal affections may result from an iritis, but more frequently affection of the iris follows that of the cornea and is usually due to direct continuity of tissue through the ligamentum pectinatum. More important, however, are the secondary affections of the ciliary body and choroid. This complication

would be suspected, if impairment of the vision increased; if the eye became extremely sensitive to touch, or if there was increased episcleral redness and most characteristic of all would be opacities of the vitreous, as revealed by ophthalmoscopic examination. The tension should also be watched in suspected involvement of the uveal tract, as in irido-choroiditis it is apt to be increased, while in irido-cyclitis it is the reverse. Glaucoma is liable to occur, especially where there has been total posterior synechiæ, and is due to the accumulation of fluid in the vitreous chamber, resulting from the closure of the passage between the anterior and posterior chambers of the eye. Cataract, especially capsular, results from the adhesions of the iris to the lens capsule.

DIAGNOSIS.—As iritis often resembles very closely an attack of acute glaucoma, the importance of an early diagnosis between the two diseases cannot be over-estimated, because the treatment of the two diseases in certain very essential respects is diametrically opposite. In iritis dilatation of the pupil is of the *utmost importance*, in glaucoma contraction of the pupil is equally essential. The differential diagnosis is, as a rule, readily made, but in rare cases it is almost impossible.

#### DIFFERENTIAL DIAGNOSIS.

##### Acute Glaucoma.

1. Usually a history of premature recession of the near point; that is, the patient has been unable to use his ordinary glasses, but has been changing them every little while for stronger ones.
2. May have had periodic dimness of vision.
3. May have noticed a rainbow of colors encircling a light.
4. Onset apt to occur suddenly during the night, and sets in with severe pain in the eye and head which increases in severity and is often accompanied by vomiting, fever, and general prostration. Attacks usually brought on by some sudden excitement or grief.

##### Iritis.

1. Usually no such symptom.
2. Usually no such symptom.
3. Usually no such symptom.
4. Onset more gradual, with much less severe pain, and no constitutional symptoms.

5. *Causes.* Especially a disease of old age, very rarely found under the age of thirty-five, usually in one eye. Often hereditary, sex no influence, most frequently in hypermetropic eyes. May be due to neuralgia of fifth nerve, irritation from decayed teeth. Hysteria, convulsions, nervous excitement, anxiety, mental disturbances, anger, fear, etc., are predisposing causes; also gout, acute rheumatism, atheroma, climatic changes, intoxication, indigestion, fever, sleeplessness, etc. Atropine will also cause it in some eyes.

6. Lids may be swollen and œdematous.

7. Conjunctiva inflamed, chemosed.

8. Sub-conjunctival or scleral injection.

9. Lachrymation and photophobia.

10. Cornea hazy, may have lost its sensitiveness to touch.

11. Iris may be discolored.

12. Pupil sluggish and *dilated*.

13. No synechiæ or exudation in pupil.

14. *Greenish reflex from pupil.*

15. Aqueous cloudy, anterior chamber shallow.

16. *Intense pain in the eye and head.*

17. *Eyeball is hard.*

18. Eye sensitive to touch.

19. Vision impaired and field contracted.

20. Ophthalmoscopic examination often difficult from haziness and general inflammation, but if possible find *excavation of optic disc*, retinal arteries small and pulsate, retinal veins enlarged.

5. Usually in adults from the twentieth to the forty-fifth year. May occur in one or both eyes, more often in men than women. Comes on from colds and over use of the eyes. Syphilis the most frequent cause, but may be due to scrofula, rheumatism, gout, after injuries, or secondary to other inflammations of the eye.

6. Lids red and puffy.

7. Conjunctiva inflamed, chemosed.

8. Sub-conjunctival or scleral injection.

9. Lachrymation and photophobia.

10. Cornea may be slightly hazy.

11. *Iris always discolored.*

12. Pupils sluggish but *contracted*.

13. Posterior synechiæ usually present and pupil may be partially closed by exudation.

14. Greenish reflex from pupil absent.

15. Aqueous cloudy, anterior chamber normal.

16. *Severe pain in the eye and head, which is worse at night and in damp weather.*

17. Tension may be slightly increased in rare cases.

18. Eye sensitive to touch.

19. Vision may be impaired.

20. Ophthalmoscopic examination may reveal slight hyperæmia of the optic disc.



**Iritis Syphilitica** is one of the most frequent varieties of iritis. It occurs as a secondary manifestation of acquired syphilis and in inherited syphilis as well. When occurring as a secondary manifestation, it is usually one of the latest symptoms to appear, although it may be one of the earliest. When the result of inherited syphilis, it most generally occurs about puberty, although it may occur in early infancy. The diagnosis as due to syphilis cannot be determined from the appearance of the eye alone, except when we find more or less prominent yellowish-red or dirty brown nodules (*iritis nodosa*) in the iris; but, when these nodules are present, it is almost invariably due to syphilis. These nodules vary from about the size of the head of a pin to sometimes of sufficient size to entirely fill the anterior chamber and may even involve the cornea and break through at the corneo-scleral junction and become external. The usual size is about that of millet seed. They are always found at either the pupillary or peripheral edge of the iris and may undergo fatty degeneration or become absorbed, but leave a broad synechia behind them. Syphilitic iritis has all the characteristic symptoms already described and is apt to be more tedious in its course. In most cases syphilitic iritis appears within the first year after infection. Very rarely it occurs in the later stages of syphilis, and in exceptional cases nodules appear, which are gummy tumors in this class (*iritis gummosa*). They may be observed in both the iris and ciliary body, and may attain great size, even perforating the eyeball.

**Iritis Rheumatica.**—Rheumatism as a cause of iritis is considered by some to be far more frequent than any other. Berry\* says, "the rheumatic form is decidedly the most common." In our own experience, however, syphilitic iritis has been very much more frequently met with. Rheumatic iritis is especially found in articular rheumatism and occurs in adults—from twenty to fifty years of age. Attacks of this form of iritis are apt to be more severe, of a much longer duration and relapses are especially prone to appear.

**Iritis Spongiosa.**—This clinical division of iritis is applied where there is found in the anterior chamber a yellowish-white,

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\* Diseases of the Eye.

spongy looking mass, which may completely fill the anterior chamber. This condition is due to hæmorrhages into the stroma of the iris, the fluid part of the blood transuding into the anterior chamber. The absorption of this peculiar exudation always begins in the parts nearest the cornea, and, in the progress of absorption, may sometimes appear like an opaque lens dislocated into the anterior chamber, for which it has been mistaken.

**Iritis Parenchymatosa** (*Suppurative, Purulent or Traumatic Iritis*).—In this we have all the previous symptoms of iritis together with greater swelling of the iris, exudation on the surfaces and the circulation impeded so that large blood-vessels may be seen coursing across the iris; there may be extravasation of blood into the iris and occlusion of the pupil forms rapidly. Occurs especially after operations on the eye, as in cataract extractions. It commences with considerable œdema of the lids, profuse lachrymation, chemosis and hypopyon. The iris is very much swollen and there may be a layer of pus on the anterior surface or large drops of pus in the pupil. The severity of the attack depends upon whether or not septic matter or any foreign body has remained in the eye. This form of iritis is usually complicated with an inflammation of the ciliary body or choroid and often forms a part only of a general suppurative destruction of the eye.

**Iritis Serosa** consists of a serous exudation which deposits on the posterior surface of the cornea an amorphous exudate, which may be mixed with some cell elements. These spots of exudation soon fall off into the anterior chamber and are either absorbed or remain and form hypopyon. There may be infiltration into the stroma of the cornea, which may result in sclerosis of the corneal fibres. It runs a slow chronic course and shows but few signs of inflammation.

**SYMPTOMS.**—(See *Choroiditis Serosa*.) There is a hypersecretion of the aqueous humor, which becomes slightly cloudy. Deposits of lymph attach themselves to the posterior surface of the cornea or settle to the bottom of the anterior chamber. These deposits on the posterior surface of the cornea generally take a pyramidal shape, the base of the triangle at the periphery and the apex at the centre. By changing the position of the

head the triangular-shaped mass will also change, thus proving that the deposit is on the posterior surface of the cornea and that the pyramidal form is due to gravity. The increased secretion causes a slight increase in the tension, and, as a result, the pupil becomes moderately dilated and sluggish. The anterior chamber may also be visibly deeper from the same cause. The iris is only slightly discolored. The photophobia, lachrymation, pain and pericorneal injection are very moderate and, as a rule, much less than in other forms of iritis. If the inflammation is severe and of long duration, it may result in a descemetitis or a parenchymatous keratitis. The disease is usually found complicated with some inflammatory process of the deeper structures, particularly chronic irido-choroiditis, though isolated cases uncomplicated by other diseases occasionally arise. It is much more frequently found in women than in men. The prognosis, so far as a complete cure without synechiæ, is more favorable than is plastic.

**TREATMENT OF IRITIS.**—Under this heading will be included all varieties of iritis, syphilitic, rheumatic, idiopathic, traumatic, sympathetic, purulent, spongy and serous, also descemetitis.

The first point that demands our attention is the removal of any exciting cause, as, for instance, a foreign body in the conjunctiva, cornea or interior of the eye. If it be due to swelling or dislocation of the lens forward, or to a portion of the lens substance lying against the iris, an incision should be made and the irritating object removed. When dependent upon sympathetic irritation from the other eye, which has already been destroyed, enucleation of the injured eye should be performed as early as possible. If previous synechiæ are the exciting causes, an iridectomy frequently becomes necessary.

We are sometimes compelled to treat quite severe cases of this disease as out-patients and often with excellent results, though it is far better and safer in all cases to confine the patient to the house. We should, however, in all cases, especially if severe, most positively insist upon the patient remaining in a darkened room and in bed, in order that perfect rest may be obtained both from the irritation of light and from muscular movements. A low or milk diet usually proves beneficial, unless the patient is too much debilitated. Alcohol and stimulating food are to be avoided.

*Warmth* is one of our most important aids in the treatment. It may be employed in various ways, though I would especially advise *dry warmth*, covering the eye and corresponding side of the head with a large, thick cotton pad, for by this the heat may be kept more uniform than by the application of moisture. Small bags, partially filled with fine table salt, applied hot to the eye will often relieve the severe iritic pain experienced at night.

The use of *cold applications* in all forms of iritis, excepting the traumatic iritis, has always been condemned by the best authorities until quite recently, when Helfrich\* reported its use in cases of iritis of the rheumatic form, in which there was an unusual amount of conjunctivitis, or what he says might appropriately be termed an irido-conjunctivitis. Schenck also reports in the same transactions its use in cases of syphilitic iritis. The result from the use of ice in these cases was extremely satisfactory and affords another means of combating certain intractable forms of iritis. The best method of application is the ice-bag, and in its use it is necessary to keep the patient under close supervision, as the continuous use of ice may affect the nutrition of the cornea and must be discontinued as soon as any haziness of the cornea appears.

In traumatic iritis, ice compresses may be used with great advantage.

**Atropine.**—The next point in the treatment of iritis is one of great importance and should always be attended to, viz., *complete dilatation of the pupil as early as possible by the use of Atropine*. As soon as the nature of the disease has been detected a solution of Atropine should be instilled strong enough to produce the desired result, and when the dilatation is complete we should endeavor to keep it so by a continued application of the mydriatic. In severe cases of iritis it may be necessary to use the Atropine every hour. Dryness of the throat or flushing of the face will indicate that it must be used at longer intervals or perhaps discontinued entirely. If the pupil is already bound down by adhesions which *cannot* be torn after several days' trial it is sometimes better to discontinue the mydriatic until the inflammatory symptoms have subsided, when it may again be tried to break up the adhesions. A solution of Atropine, four grains to the ounce of water, is most

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\* Trans. Hom. Med. Soc., State of New York, vol. xxvi., p. 167, 1891.



commonly employed, *but the pupils must be dilated* if possible, even if we have to employ the crude substance. These remarks regarding Atropine will apply to the various forms of iritis, with the exception of the serous variety, in which dilatation must be carefully watched, as glaucomatous symptoms may arise, when the use of Atropine must be stopped and possibly Eserine employed. If Atropine should act as an irritant or the eyes show a great antipathy to its use, some other mydriatic, as Scopolamine, Duboisine, Daturine, or Homatropine, may be substituted. The relative strength of mydriatics and myotics has been shown by Jackson,\* who found the weakest solutions producing any effect on the pupil were Homatropin hydrochlorate,  $\frac{1}{30000}$  gr., Eserin sulphate  $\frac{1}{100000}$  gr., Atropin sulphate  $\frac{1}{150000}$  gr., and Hyoscyamine hydrochlorate  $\frac{1}{300000}$  gr.

An *iridectomy* may be made in the later stages or if other treatment fails. It may also be indicated in serous iritis, if glaucomatous symptoms supervene, though frequent *paracentesis* of the cornea may relieve without causing the disfigurement from an iridectomy.

**Mercurius.**—Mercury in its various combinations is our “sheet-anchor” in the treatment of *all forms of iritis*, especially the syphilitic, and the cases which call for its use present a great variety of symptoms, differing widely in both character and intensity. *The pains are usually severe, of a tearing, boring, cutting, burning nature, chiefly around the eyes, in the forehead and temples* and accompanied by throbbing, shooting, sticking pains in the eye, though in rare cases they may be almost or entirely absent. These pains, as well as all the symptoms of the mercurials, are *always worse at night after going to bed and in damp weather*, in this respect corresponding very closely to the disease. There is generally much heat both in and around the eye and soreness of the corresponding side of the head to touch. *Great sensitiveness to heat or cold* may be found; *also to light, especially the glare of a fire*. Acrid lachrymation may be present. *The pupil is contracted and overspread by a thin bluish film, while there is great tendency to the formation of adhesions (posterior synechiæ)*. The iris is discolored, aqueous cloudy and ciliary injection marked.

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\* Journ. Am. Med. Assoc., Oct., 1895.

Hypopyon may be present or not. Gummata may also be found on the iris. The lids may be red, swollen and spasmodically closed, or even normal in appearance. The concomitant symptoms of *nocturnal pains* in different portions of the body, perspiration at night, condition of tongue, mouth and throat and eruptions on the skin are of great importance in selecting this drug and in choosing between the different preparations.

The *Corrosivus* is most frequently employed and proves most beneficial, as the *intensity of the symptoms* is more marked under this than any other form.

The *Solubis* comes next in order of usefulness and should be given if the above symptoms are present and if the inflammation is of medium intensity or lower grade and if certain characteristic general symptoms are observed.

The *Dulcis* is to be thought of when iritis is found in very scrofulous subjects, especially children with pale, flabby skin, and when associated with corneal ulceration.

The *Proto-iodide* should be chosen from concomitant symptoms, as *thick yellow coating on the base of the tongue*, enlarged glands, etc., and when *superficial ulceration of the cornea* complicates the difficulty, especially if found during the course of pannus.

**Kali iod.**—An important remedy in *syphilitic iritis*, especially after mercurialization and if the secondary eruption on the skin is present. The special indications are not marked, *though the inflammation is usually of high degree*. It has been given upon general principles in many instances with excellent success. It often relieves when given in large doses when the potencies have failed.

**Aurum.**—Chiefly serviceable in *syphilitic iritis* and after overdosing with mercury or potash. There is much *pain, which seems to be deep in the bones* surrounding the eye, of a tearing, pressing nature, often extending down into the eyeball, with burning heat, especially on trying to open the eyes; the pressing pain is usually from *above downward* and from *without inward*, aggravated on touch. The mental condition of the patient is that of great depression; this, together with the bone pains in other portions, aid us materially in our choice.

**Cinnabaris.**—Of great value in the treatment of iritis, particularly syphilitic and if gummata are present in the iris. The

characteristic *pain commences at the inner canthus and extends across the brow or even passes around the eye*, though there may be shooting pains through the eye into the head, especially at the inner canthus. Sharp pain over the eye, or soreness along the course of the supra-orbital nerve and corresponding side of the head. Like mercury, the *nocturnal aggravation* is usually marked and the symptoms intermit in severity.

**Hepar.**—Especially serviceable if the inflammation has extended to the neighboring tissues, cornea (kerato-iritis) and ciliary body (irido-cyclitis) or after gummata have ruptured, and if there is *pus in the anterior chamber (hypopyon)*. Especially in suppurative iritis. It is also of value in *purulent irido-capsulitis* after cataract extraction. The pains are pressing, boring or *throbbing* in the eye, *ameliorated by warmth* and aggravated by motion. *The eye is very tender to touch*. There is usually much photophobia and great redness of the conjunctiva, even chemosis, while the lids may be red, swollen, spasmodically closed and sore to touch. The patient feels chilly and wants to keep warmly covered.

**Rhus tox.**—Idiopathic or rheumatic iritis, if caused by *exposure to wet*, or if found in a rheumatic patient. *Suppurative iritis, particularly if of traumatic origin, as after cataract extraction*, more often calls for Rhus than any other remedy. Also useful in kerato-iritis. *The lids are œdematously swollen, spasmodically closed, and, upon opening them, a profuse gush of tears takes place. There is chemosis*, the photophobia is marked and the pains are various, both in and around the eye, *worse at night*, especially after midnight, and in damp weather. The swelling of the lids often involves the corresponding side of the face and may be covered by a vesicular eruption. Concomitants must be taken into consideration.

**Bryonia.**—Iritis resulting from exposure to cold not infrequently calls for this drug, especially if occurring with a rheumatic diathesis. The pains may be sharp and *shooting* in the eyes, *extending through into the head, or down into the face*, or there may be a sensation of *soreness and aching* in and around the ball, especially behind it, extending through to occiput; the patient also sometimes describes the pain "*as if the eye was being forced out of the socket.*" All the pains are generally aggravated by

*moving the eyes in their sockets, or upon any exertion of them, and at night.* The seat of pain often becomes sore to touch. In the serous form it also proves serviceable.

**Asafoetida.**—*Especially indicated in the syphilitic variety and after the abuse of mercury.* The pains are severe in the eye, above it and in the temples, of a *throbbing, pulsating*, pressing, burning or sticking character and tend to become periodic; they extend usually from *within outward* and are *relieved by rest and pressure* (reverse of Aurum).

**Thuja.**—*Syphilitic iritis, with gummata on the iris. Large wart-like excrescences on the iris, with severe, sharp, sticking pains in the eye, aggravated at night and ameliorated by warmth.* Usually accompanying the above we find *much heat* above and around the eye and in the corresponding side of the head; there may also be tearing, dull, aching pains in the brow, or a pain above the eye (left) as if a nail were being driven in. *Ciliary injection* decided, even in some cases amounting to inflammation of the sclera. Lids may be indurated, noises in the head, etc.

**Cedron.**—This remedy is particularly of value in relieving the severe *ciliary neuralgia* observed in iritis, if *supra-orbital*, seeming to follow the course of the supra-orbital nerve, especially if there is marked periodicity.

**China.**—Iritis dependent upon the *loss of vital fluids*, or malaria. The pains are variable, but have a marked *periodicity*. The *muriate of quinine*, in appreciable doses, will often relieve *severity of the pains*, especially when of an *intermittent type* and accompanied by *chills and fever*.

**Nitric acid.**—Chronic syphilitic iritis of a low degree, with very little or no nightly pain. The pains may be worse during the day and are of a pressing, stinging character. Posterior synechiæ will be found.

**Arsenicum.**—Iritis, with *periodic burning pains, worse at night, after midnight*, ameliorated by warm applications. Frequently indicated in serous iritis.

**Aconite.**—In the *very first stage*, or, in a sudden reappearance, this remedy is often of the greatest value, especially if occurring in young, full-blooded patients and when the cause can be traced to an *exposure to a cold draught of air*. It is the most commonly indicated remedy in *traumatic iritis*. The ciliary injec-



tion is usually marked, pupils contracted and pains often severe, beating and throbbing, especially at night. There is a sensation of *great heat, burning* and dryness in the eyes.

**Arnica.**—Rheumatic iritis has been benefited, though its special sphere of action is in the *traumatic variety*, in which it may be employed with advantage.

**Belladonna.**—Early stages of iritis, caused from a cold; or chronic plastic iritis, following cataract extraction, with much redness and severe *throbbing pain* in the eye and head, worse at night. Sensitiveness of the eyeball to touch, congestion of the face, etc.

**Clematis.** — By some, this drug is considered to be as frequently called for as Mercury, in iritis and kerato-iritis, though we have never used it to the same extent. Chronic syphilitic iritis, with very little pain. The pains are similar to those of Mercurius, but there is usually much heat and dryness in the eye and great *sensitiveness to cold air*, to light and bathing.

**Conium.**—Descemetitis, with *excessive photophobia* and but little redness or apparent inflammation.

**Euphrasia.**—Rheumatic iritis, with constant aching and occasional darting pain in the eye, always worse at night; ciliary injection and photophobia great; aqueous cloudy; iris discolored and bound down by adhesions.

**Gelsemium.**—In *serous iritis* alone or complicated with choroidal inflammation, Gelsemium is the most prominent remedy. There is hypersecretion and cloudiness of the aqueous, with moderate ciliary injection and pain.

**Hamamelis.**—Iritis traumatica, or other forms in which *hæmorrhage has taken place into the iris or anterior chamber*.

**Kali bichrom.**—It is *the* remedy for true *descemetitis* characterized by fine punctate spots on the posterior surface of the cornea, especially over the pupil, with moderate redness and very little photophobia. May be required in syphilitic iritis.

**Natrum salicyl.**—Iritis with intense ciliary neuralgia, especially resulting from operations on the eye.

**Nux vom.**—May be useful at the beginning of the disease or as an intercurrent, especially in the syphilitic form, if there is much photophobia, lachrymation, etc., *in the morning*.

**Petroleum.**—Syphilitic iritis accompanied by *occipital headache*.

Pain in eyes pressing or stitching and skin around the eyes dry and scurfy.

**Spigelia.**—Rheumatic iritis, if the pains are *sharp and shooting both in and around the eye, especially if they seem to radiate from one point.*

**Sulphur.**—Iritis, particularly if chronic and found in strumous subjects, may find its remedy in Sulph., also if *hypopyon* complicates the trouble. May be of service as an intercurrent, even if it does not complete the cure. The pains are usually of a *sharp, sticking character*, worse at night and toward morning. General indications will decide our choice.

**Terebinth.**—Rheumatic *iritis with intense pains in the eye and head*, especially if resulting from suppressed perspiration of the feet. Pain in the back and dark urine will be present.

The following remedies have also been employed in occasional cases with favorable results. Their meagre indications can be found by reference to Part II. Arg. nit., Croc. tig., Prunus sp., Puls., Sil., Staph. and Zinc.

**Tumors of the Iris.**—Both simple and malignant tumors are met with in the iris.

*Cysts*, both *epidermoid* and *serous*, are in the large majority of instances due to traumatism. The *epidermoid* is usually the result of a penetrating wound, by which one of the cilia is carried into the iris and is found to consist of cells covered with pavement epithelium and sometimes surrounded by a thin connective tissue membrane. The appearance is that of a yellow, opaque tumor, and it may undergo fatty degeneration. The *serous* cyst is merely distended iris tissue, which may become so thin as to be simply a structureless membrane. The appearance is that of a grayish-white or translucent tumor and its contents are similar to the aqueous humor.

The *treatment* consists of excising them as early as possible, and care should be taken not to rupture the cyst wall during removal.

*Melanoma* is an extremely rare form of tumor affecting the iris. It is merely a hyperplasia of the pigmented cells of the stroma of the iris and appears as a small black tumor. They are benign, usually congenital, more or less stationary and produce no irritation. Rarely they have been seen to develop into a melanoma-sarcoma.

*Granuloma* may very rarely appear in children as a pale red or yellow vascular tumor, which may gradually increase, involve the cornea and perforate, when it appears like a spongy mass, bleeding easily and resembling a sarcoma. They may also occur from a prolapse of the iris or after operations. They have been found to consist of numerous small, round, irregular or spindle-shaped cells, with a few large nucleated cells and may be covered with epithelium.

*Sarcoma* are very rarely found occurring primarily in the iris. One reported by Andrews\* was first excised with a piece of the iris and one week later the eye enucleated. They are usually an extension from the choroid or ciliary body and are most frequently of the pigmented variety. Limbourg† reports a case of leucosarcoma with complete details of the microscopical examination. The eye should be enucleated.

*Tubercles* appear chiefly in children and most frequently at the periphery of the iris and are accompanied by more or less inflammation. They appear in two forms, either as miliary tuberculosis characterized by a number of grayish semi-translucent nodules, which may subside spontaneously, or as a solitary tubercle of a yellowish-white color, which may increase to such a size as to finally perforate the cornea. The treatment when they are increasing in size is either to excise by an iridectomy or enucleation. They may increase in size and number and should be either excised or the eye enucleated.

**Mydriasis.**—Dilatation of the pupil may occur in one eye or both, and may result from various causes.

*Irritation* mydriasis occurs from intestinal irritation, as in worms; from spinal or cerebral irritation, as in hyperæmia or new growths and in acute mania or melancholia. It is also found in hysteria and sexual irritation.

*Paralytic* mydriasis is found in diseased processes at the base of the brain, in orbital processes, or intra-ocular tumors where there is pressure on the ciliary nerves, in glaucoma, diphtheria, syphilis, etc., from injuries, simple cold or draughts of air. Von Graefe‡

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\* N. Y. Med. Journ., June 1, 1889.

† Archiv. Ophthalm., vol. xix., p. 239, 1890.

‡ Archiv. f. Ophthalm., III, pt. III, p. 350.

considers unilateral mydriasis occurring at short intervals, first in one eye then the other, as a premonitory sign of mental derangement.

Mydriasis occurs as a paralytic affection of the third nerve or as a result of some irritation of the sympathetic. It causes a dimness of vision from too much light and an increase of the circles of diffusion.

This functional disturbance of the pupil is, therefore, usually merely a symptom of deeper and more serious trouble and requires remedies adapted to that condition. It is, however, sometimes found uncomplicated with other disorders, being dependent upon cold, trauma, etc., in which case Arnica, Bell., Caust. and a score of remedies may be indicated. The instillation of sulphate of Eserine is often also of great service. As mydriasis is generally associated with paralysis of one or more of the ocular muscles, refer for treatment to paralysis of the muscles.

**Myosis.**—Contraction of the pupil is, physiologically, greater in infants and old age than in middle life; is greater in hyperopes than in myopes and in those who use the eyes steadily at fine work.

*Spastic* myosis or contraction of the pupil due to spasm of the third nerve may be dependent upon some irritation or inflammation of the eye, as in hyperæmia of the iris, or from some irritation of the cerebral centre, as in the early stages of inflammation of the brain or its meninges and when this myosis gives way to mydriasis it is a serious prognostic sign indicating the stage of depression with paralysis of the third nerve. It also occurs in the early stage of apoplexy, intra-cranial tumors, hysteria or in epileptic attack and in tobacco or alcoholic amblyopia.

*Paralytic* myosis occurs in spinal lesions above the dorsal vertebræ, in general paralysis of the insane, and is a prognostic sign of general paralysis approaching when it follows the dilated pupil of acute mania and may be due to a paralysis of the cervical sympathetic from injury.

*Spinal* myosis is nearly always bilateral and may be preceded or accompanied by atrophy of the optic nerve and contraction of the field of vision. This form of myosis is seen in tabes dorsalis, and, from the peculiarity of the contraction of the pupil, it is



called the Argyll Robertson pupil, as he first called attention to it in 1869. In this, the pupil is contracted, and, while not responding at all or very feebly to light, responds actively to convergence and is always indicative of a serious central lesion.

Contraction of the pupil unassociated with more serious disturbance is of rare occurrence; the cause, therefore, usually demands our attention. Atropine instilled into the eye may be employed, though it generally gives only temporary relief.

*Jaborandi* and *Physostigma ven.* are especially recommended for this condition, though various remedies which produce contraction of the pupil may be thought of.

**Hippus.**—Is a spasmodic pupillary movement irrespective of light or accommodation. There is an alternate contraction and dilatation of pupil which may occur in nystagmus, in multiple sclerosis, acute meningitis, after epileptic attacks, in hysterical spasms, etc.

**Iridodonesis.**—Tremulousness of the iris is dependent upon loss of support of the iris and is usually the result of a partial or total dislocation or absence of the lens. It may also occur in hydrophthalamus, or when there is an increased amount of fluid in the posterior chamber. There is nothing to be done for it.

**Iridoncosis.**—Atrophy of the iris is the result of inflammation, usually a chronic parenchymatous iritis, and sometimes occurs after perforation of the cornea where the anterior synechiæ have kept up the inflammation. It consists of a fatty degeneration.

**Hypæmia.**—Blood in the anterior chamber is usually of traumatic origin, although may be spontaneous, as a result of some intra-ocular inflammation, as iritis. It may be but slight, or sufficient to entirely fill the anterior chamber, and is usually rapidly absorbed by the application of a compress-bandage and the internal administration of Arn., Aurum, Ham. or Ledum.

**Iridodialysis.**—A separation of the iris from its peripheral attachment is usually traumatic, as from a blow on the eye, which spreads the cornea at the corneo-scleral junction, causing a separation, or from operation, as in iridectomy.

**Coloboma Iridis.**—Congenital absence, due to an arrest of development of a part of the iris, of either one or both eyes, is not uncommon. It is usually complicated with other congenital anomalies, especially of the choroid, or may be of the lens, or optic nerve, or in microphthalmos. It may extend to the periphery or not, and is usually downward, or downward and inward, and may be of various shapes. Pollak\* reports three cases and gives the literature upon coloboma of the iris.

**Irideræmia** (*Aniridia*).—Absence of the iris may be total or partial, but it is usually total and in both eyes. When complete, we may be able to see the ciliary processes, unless small or atrophied. The lens usually becomes opaque, vision is decreased and nystagmus often accompanies it. Stenopaic glasses may improve.

**Membrana Pupillaris Persistans** consists of the presence of two or three fibres running across the pupil which are attached on the anterior surface of the iris and external to the sphincter. During the greater part of intra-uterine life the pupillary membrane stretches across the pupil, and in normal eyes it remains permanent after birth only in that part which covers the iris, whose endothelial layer it becomes; but occasionally small shreds will remain and are called persistent pupillary membrane.

**Heterochroma** is the term applied to variations in the color of the iris. In one eye the iris may be black or brown and in the other blue, or the two colors may exist in different sections of the same iris.

*Corectopia*, an anomalous position of the pupil; *Diplokoría*, double pupil, and *Polycoria*, many pupils, are all congenital anomalies which are sometimes met with.

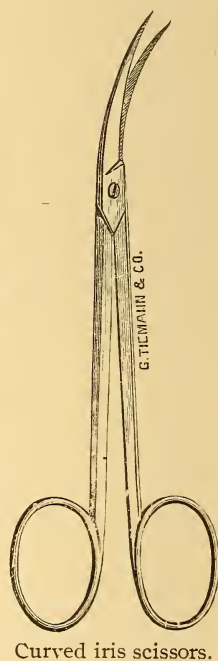
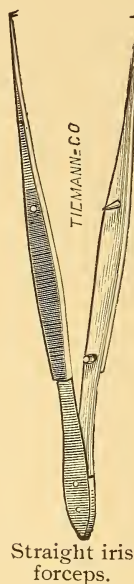
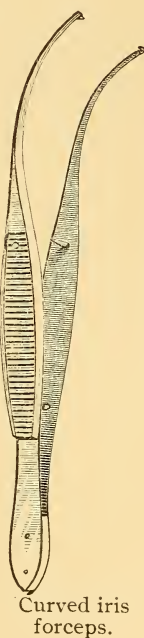
**Operations on the Iris—Iridectomy.**—This operation, consisting in the excision of a portion of the iris, is the one most frequently made for both therapeutic and optical measures. It is indicated for therapeutic purposes in glaucoma, staphyloma, posterior synechiæ and sometimes may be of value in obstinate cases of re-

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\*Archiv. Ophthalm., vol. xx., p. 410, 1891.

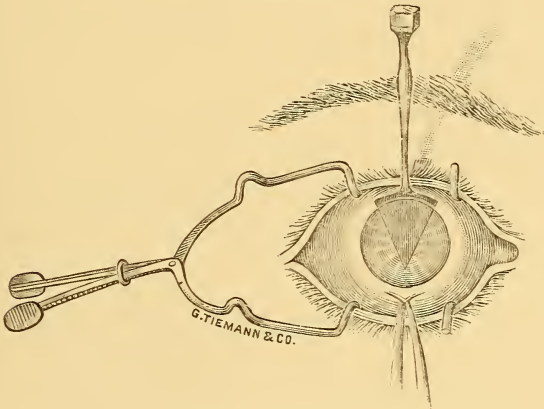
current iritis, or in keratitis with deep ulceration or hypopyon. It is also indicated in tumors of the iris or for foreign bodies in the iris and is frequently performed preliminary to cataract extraction. For optical purposes it may be indicated in opacity of the cornea, occlusion of the pupil, central opacity or dislocation of the lens and in cataract extraction. Iridectomy, when made for visual purposes, should of course be made where there is the least opacity of the cornea and lens, preferably below and a little to the inner side, if possible. When made for therapeutical purposes it is preferably above, that the upper lid may cover the deformity as much as possible. The size of the iridectomy, when made for optical purposes, should be small and large when made as a therapeutical measure.

FIG. 67.    FIG. 68.    FIG. 69.    FIG. 70.    FIG. 71.



The instruments needed for this operation are a speculum (see Fig. 49), fixation forceps (see Fig. 50), an angular or straight keratome (Figs. 67 and 68), or Graefe cataract knife; either curved or straight iris forceps (Figs. 69 and 70) and a pair of iris scissors (Fig. 71). Cocaine anæsthesia is usually sufficient in all cases, excepting, possibly, in glaucoma or an especially nervous subject, when a general anæsthetic should be administered. The eyelids are kept open with the speculum and the eye steadied by a firm hold with the fixation forceps directly opposite the point at which the incision is to be made. The keratome is then inserted in the sclerotic at the corneo-scleral margin (except when made for therapeutical purposes, when it should be from one to two mm.

FIG. 72.



Iridectomy—The incision.

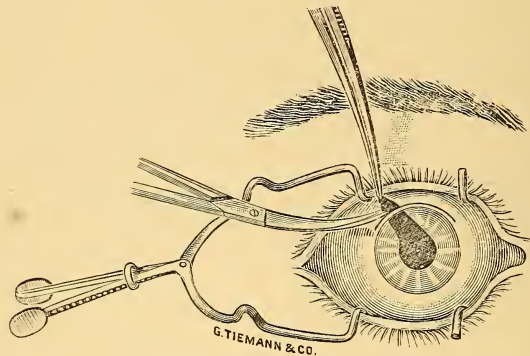
from the edge of the cornea) obliquely and in such a direction that, if continued, it would wound the iris and lens; but, as soon as the point is seen in the anterior chamber, the handle is depressed so as to bring the blade into a plane anterior and parallel to that of the iris and the blade is pushed forward into the anterior chamber until an external wound of sufficient size has been attained. The keratome is now to be slowly withdrawn, with its apex toward the cornea and well away from the iris and lens. The aqueous escapes with the withdrawal of the knife and should be allowed to pass off slowly. The iris forceps are now entered, closed, into the anterior chamber, opened, and the iris seized near



its pupillary edge, drawn out and cut off by an assistant at one cut of the scissors, or, as some prefer, drawing it to one side of the wound and partially snip it off and then drawn to the other angle, where the excision is completed (Figs. 72 and 73). Care should be taken to see that the cut edges of the iris go back into place, if not they may be pushed in with a hard rubber spoon, as none of the iris should be allowed to remain in the wound. The eye is then closed and a compress bandage applied.

*The Accidents from Iridectomy* are first, from an injury of the lens by the keratome. This is a very serious accident which will be followed by partial or complete cataract and possibly glaucoma from swelling of the lens. Sometimes the keratome will enter the layers of the cornea instead of the anterior chamber when making the incision, due to its being held too obliquely. When this is discovered, the instrument should be withdrawn and a fresh in-

FIG. 73.



Iridectomy—Cutting the iris.

cision made. Hæmorrhage into the anterior chamber, if occurring after the excision of the iris, requires no attention, as it will be rapidly absorbed, and if it occurs before the iris is cut, the blood can usually be made to flow out by depressing the edge of the wound. Hæmorrhage into the fundus of the eye is apt to occur during iridectomy for glaucoma and is of serious import. It results from a too rapid escape of the aqueous on the withdrawal of the keratome.

*Iridotomy (Iritomy)* consists in the formation of an artificial pupil

by simple incision of the iris. It is only occasionally adopted, and that in cases of absence of the lens, when the pupil is closed and the iris adherent to the lens-capsule, as may sometimes occur after cataract operation, where the iris has been put on the stretch by being drawn upward by the cicatrix. It is best made after De Wecker's method,—a vertical incision about 3 mm. long is made in the cornea about the same distance from its margin with a keratome. De Wecker's forceps-scissors are then entered, closed, into the anterior chamber. The blades are opened and the sharp point of one is forced through the iris, by closing the blades the tightly stretched iris-fibres are cut through and from their retraction a central clear pupil is formed.

*Iridodialysis* is a tearing away of the periphery of the iris. This operation is rarely done and only when the extreme margin of the cornea is the only clear portion.

*Iridaevulsion*.—Removal of the entire iris by tearing it from its periphery has been performed with remarkable effect by Noyes in cases of hydrophththalmus. The iris should be seized by the forceps or hook at its periphery opposite to the point of opening of the cornea and drawn out. Care must be taken not to injure the lens.

*Corelysis*.—The breaking of pupillary adhesions by the hook or toothless forceps has not proved a great success, owing to their tendency to re-form and the danger of wounding the lens.

*Iridodesis* consist in drawing the pupillary edge of the iris through a small opening in the margin of the cornea and securing it by a fine silk suture on the outside. This operation was formerly practiced by Critchett and others, but has fallen into disuse from the possible danger of sympathetic ophthalmia.

## CHAPTER XV.

## Diseases of the Ciliary Body.

**Anatomy.**—The ciliary body is that part of the uveal tract extending from the periphery of the iris to the choroid, and consists of the ciliary processes and ciliary muscle.

FIG. 74.



A section through the ciliary region.

The *Ciliary Processes*, some seventy or eighty in number, are composed of a connective tissue stroma, continuous with that of the iris and ligamentum pectinatum, of blood-vessels arranged in convolutions or folds, and overlaying these folds is a densely pigmented layer. The tips of the ciliary processes lay a little in front

of the edge of the lens, but are not in contact with it. From the posterior surface of the processes extends a transparent structure called the zonule of Zinn or suspensory ligament of the lens. This is derived from the hyaline layer on the inner surface of the ciliary body, and, as it passes to the border of the lens, it splits up to go to each surface of the lens, leaving a small triangular space called the canal of Petit. Through this structure trans-fusion from the vitreous to the aqueous humor takes place. The ciliary processes, while not erectile, enlarge or shrink with variations of blood pressure.

The *Ciliary Muscle* is composed of three sets of unstriated fibres: The meridional, running parallel to the sclerotic; the circular, forming a ring parallel to the cornea; and the radiating fibres. Iwanoff has shown that in certain myopic eyes, the circular fibres may be entirely lacking, and, on the contrary, in hyperopic eyes are so highly developed that they form one-third of the ciliary muscle.

As to the action of this muscle Heinrich Müller ascribes a different action to each set of fibres:

1. "The circular fibres of the ciliary muscle exert a pressure upon the edge of the lens, by means of which the latter becomes thicker."

2. "The longitudinal fibres of the muscle cause an increase of tension in the vitreous humor, on account of which the posterior surface of the lens is prevented from shifting and the action of the peripheral pressure is chiefly confined to the anterior surface," and also, that, "The arching forward of the centre of the anterior surface of the lens is rendered possible and favored by the recession of the peripheral portion of the iris, which is accompanied by a contraction of the deeper (circular) layer of the ciliary muscle and the iris." Thus we see that the circular fibres of the ciliary muscle are the ones by which the act of accommodation is chiefly caused, and, further, that these circular fibres are especially developed in hyperopic eyes.

The vessels supplying the ciliary body are the posterior and anterior ciliary. The nerves are from the ciliary, forming a network in which are multi-polar ganglion cells containing sensitive, motor and sympathetic filaments. From this plexus fibres pass to supply the ciliary body, iris and the cornea.



**Cyclitis.**—Inflammation of the ciliary body is very rarely found uncomplicated with other diseases and usually, except when caused by wounds, is an extension of a choroiditis, or iritis, and when the inflammation commences in the ciliary body it usually extends to these other parts, and in fact the iris is always more or less involved. The recognition of cyclitis is essential on account of the danger to vision it threatens. The distinction between cyclitis and iritis is not an easy one, and it is necessary, therefore, to search carefully for the characteristic signs, which are the extreme sensitiveness to touch, cloudiness of the vitreous and the change in the tension, which is first increased and later decreased. Cyclitis may occur as either a plastic, serous or purulent inflammation.

**Cyclitis Plastica.**—**PATHOLOGY.**—The pathological changes are the same as those found in plastic inflammation of the iris, viz.: Hyperæmia, swelling of the stroma cells, accumulations of wandering cells and an exudation of an amorphous mass, especially on the inner surface of the ciliary body. The exudation may extend forward upon the posterior surface of the iris and may fill the whole of the posterior chamber. It may be deposited on the posterior surface of the cornea, floating about in the aqueous, or be found in the iritic angle. There is also an exudation into the vitreous, especially in its anterior portion, causing it to become hazy, which, as it gradually absorbs, leaves opacities floating in the vitreous that may become membranous. If the disease goes on, the retina and choroid become affected and the retina detached from the contractions of the pathological membrane and filled with a sero-albuminous fluid. In the late stages the ciliary processes may become detached from the sclera. The exudation is the same, only more extensive than in iritis.

**SYMPTOMS.**—There is ciliary injection and often chemosis. The iris may be discolored and the pupil contracted, but there are no synechiæ, unless the iris is involved. The veins of the iris are engorged, owing to the swelling of the ciliary body preventing a return of the blood from the iris. Pain is usually a prominent symptom; it is generally quite severe in and around the eye and often extending into the head—in fact, about the same as that in iritis. The most characteristic symptom is the *extreme sensitive-*

*ness of the eye to touch.* There may or may not be haziness of the aqueous, but the haziness of the vitreous is almost invariably present in the early stages, appearing on weak illumination like fine dust floating in the anterior part of the vitreous. The anterior chamber may be deepened in the earlier stages, and later it may be shallow from fluid or exudation behind the iris or lens pressing it forward. There is a rapid loss of vision and the accommodation is impaired. The tension may be either increased, decreased, or normal.

**Cyclitis Serosa.**—In this we have the same pathological changes as in serous iritis and it is always invariably accompanied by serous infiltration of other parts of the uveal tract. The symptoms are the same as just described, but less severe. The tension, however, in serous cyclitis is apt to be increased and the pupil is usually dilated. (See *Choroiditis Serosa*.)

**Cyclitis Purulenta** —In this there is a very marked lymphoid infiltration. The pus will extend into the aqueous humor, forming an hypopyon, which in purulent cyclitis may come and go very quickly. The disease, as a rule, passes over into panophthalmitis, in which there is a suppuration of the whole eyeball with subsequent atrophy. In sub-acute cases we may find a diminished tension, but there is generally increased tension. All the symptoms of the plastic form are present in this, and even of a higher degree.

**CAUSES.**—Cyclitis, when not dependent upon other inflammations, most frequently results from some form of injury, as in contusions of the eye or penetrating wounds in the ciliary region; after cataract operations where the incision was far back in the sclera; from dislocation or swelling of the lens from rupture of its capsule. It may occur from a prolapse of the vitreous through a scleral wound, or from a contraction of scars in the ciliary region. It may, however, be spontaneous so far as any direct cause can be determined, and is often from sympathetic inflammation. It chiefly occurs as secondary to inflammations of the iris or choroid.

**PROGNOSIS** is most unfavorable in the purulent form, as it generally leads to suppuration of the entire eye. In the plastic form the prognosis is also unfavorable, because from its pathological

changes, the vitreous loses its nutrition, becomes fluid, the retina detached, lens cataractous and the eyeball becomes atrophied.

TREATMENT should first be directed to the cause. If dependent upon a foreign body, it may be removed by the magnet; if due to a dislocation or swelling of the lens, remove it; if there is a wound with a prolapse of the iris, it should be drawn out and cut off and a compress bandage applied.

The treatment of inflammation in this portion of the uveal tract will depend almost exclusively upon internal medication. The eye must be kept warm, as in iritis, and Atropine may be necessary, as the iris is liable to become involved, but must be used with caution from the danger of increased tension. Special indications for remedies are to be found under Iritis, page 296.

**Injuries Implicating the Ciliary Region** are not only dangerous on account of inflammatory complications, but as a cause of sympathetic ophthalmia. Simple incised wounds may readily unite by keeping the eye at rest, or it may be necessary to use a fine suture, which should be inserted from within outward in both edges of the wound. Extensive injuries in this region will usually necessitate enucleation, though under certain circumstances the eye may be preserved, providing the patient is intelligent and will attend to the first unfavorable symptoms which may arise. Foreign bodies must be removed, if it is possible, without too much injury to the tissues, or the eye must be sacrificed. Nettleship has called the region of about 5 mm. around the cornea the "dangerous zone," because an injury of this zone is almost certain to implicate the ciliary body.

**Paresis Musculi Ciliaris.**—*Paralysis of the Accommodation.*—This may be either partial or complete, and the cause may be either local or general. If but one eye is affected, the cause is more apt to be local, affecting the third nerve in some part of its course, and the primary cause may be syphilis. Some injury of the eye or orbit may cause it, through some reflex influence, as may also some irritation of the fifth nerve, as in decayed teeth, etc. Exposure to draughts of air may also cause a one-sided paralysis of the accommodation. When the paresis affects the ciliary muscle of both eyes the cause is more apt to be general and

often from some constitutional disorder. The most frequent cause is diphtheria and comes on usually during convalescence or some time after. Paralysis of the accommodation is also seen after fevers, such as typhoid and recurrent fever. It also occurs in diabetes, articular rheumatism, locomotor ataxia, after debilitating excesses, as masturbation, sexual indulgence, etc. It is sometimes found due to uterine disease and from syphilis. Exposure to draught is a very frequent cause, and it has often been seen following la grippe. It is also present with paralysis of the external muscles in total paralysis of the third nerve.

The diagnosis of paralysis of the ciliary muscle depends upon the one constant symptom, viz., the diminution or complete abolition of the amplitude of accommodation from a recession of the near point. This will always be suspected in subjects who formerly had good vision for near objects, but find they can only see well at a distance. The pupil will usually, at the same time, be dilated, though frequently there will be a paresis of accommodation without mydriasis.

PROGNOSIS is, as a rule, in these cases favorable, for as the majority of cases result from diphtheria, fevers, etc., the proper treatment will effect a relief. It must be borne in mind, however, that the paralysis of the accommodation may be the forerunner of some grave general condition which may be of serious import to the life of the patient, as, for example, when due to diabetes, to some obscure cerebral or spinal disease, etc. Hence the prognosis always depends upon a correct diagnosis as to the cause of the malady.

TREATMENT.—The cause of the paralysis must be sought out and given due consideration in the treatment. As precautionary measures, all convalescents should be carefully warned of the danger of overtaxing the eyes. The use locally of Eserine or Pilocarpine, of sufficient strength to slightly contract the pupil and stimulate the accommodation, is of great value. Eserine is the most active of the two, and the best results are had from a weak solution of the sulphate. A one-tenth to one-half grain to the ounce solution, instilled once or twice a day, is sufficient and usually better than a more concentrated solution. Pilocarpine is less energetic, and a solution of from two to four grains of the muriate to the ounce may be instilled once or twice a day if any unpleasantness is experienced from the Eserine.



Galvanism should also be employed, using from two to five milliamperes, with the positive pole applied to the base of the occiput and the negative over the closed lids. The current should be applied for two or three minutes daily. Patients may also be allowed moderate use of the eyes for necessary work with the proper convex glass.

The use of the appropriate remedy will also be of much service, and attention is especially directed to Acon., Argent. nit., *Caut.*, *Gels.*, Opium, Paris quad. and Physostig. See indications under *Paralysis of the Ocular Muscles*, page 160.

**Spasmus Musculi Ciliaris.**—*Spasm of the Accommodation.*—This may be *clonic*, when existing only during convergence, or during fixation for distinct vision and ceases when the eye is in repose; or *tonic*, when it is permanent and only yielding to mydriatics. Spasm usually affects both eyes in an equal degree, but may exist in one alone, or be of a greater degree in one eye than in the other. Spasm of the ciliary may occur in normal eyes or in any refractive error of the eyes. It causes a decrease of the hypermetropia and an increase of the existing myopia. It may produce an apparent astigmatism or conceal a real one. Patients will usually complain of an indistinctness of distant objects, while near objects are held closer to the eye than they should be, and they will have tired, strained feelings of the eyes together, with headaches upon using the eyes.

There may be in some cases a tendency to convergence of the eyes, owing to the intimate relation between accommodation and convergence. Spasm of the accommodation is frequently found in children with hypermetropia from the strain occasioned by use of the eyes; it may be produced in emmetropes from prolonged use of the eyes and in myopes from the use of too strong glasses. As other local causes we find it in injuries of the eye, in inflammation of the cornea, conjunctiva, sclera or lids. It may occur as symptomatic of affections of the central nervous system, as in epilepsy and hysteria. Spasm of the ciliary muscle may or may not be associated with contraction of the pupil. The condition occurs most frequently among asthenic subjects and more especially among young girls. The diagnosis of spasm depends upon a comparison of the apparent refraction with that which is real, as

determined by an examination under the influence of a mydriatic.

**TREATMENT.**—In aggravated cases of spasm of the ciliary muscle the regular and prolonged use of Atropine or the constant use of convex glasses may be necessary, but usually internal medication, with rest of the eyes for near work, will suffice to diminish the spasm; after which any anomaly of refraction may be corrected.

**Jaborandi.**—In *spasm of the accommodation, or irritability of the ciliary muscle*, there is no remedy so frequently useful as this. Many cases of simulated myopia have yielded to its use. *Everything at a distance is blurred without concave glasses, though near objects are seen distinctly. The vision may be constantly changing. Nausea or vertigo on using the eyes.* Eyes tire easily and are irritable, especially on sewing. Twitching of the lids and pain in the eyeballs. Spasm of the internal recti muscles.

**Eserine.**—Dr N. L. Macbride has pointed out the value of this drug in spasm of the accommodation, and has found it of much value in young hyperopes of slight degree, associated with headache and general asthenopic symptoms. The physiological action of Eserine is to produce an almost perfect picture of spasm of the accommodation.

**Physostigma ven.**—In its proving there has been developed marked spasmodic action of the ciliary muscle and muscles of the lid. It has, therefore, been used with manifest advantage in these conditions, particularly the former. The patient cannot read long on account of this spasm and must bring the book near the eyes. There is also generally to be seen *twitchings in the lids and around the eyes* when Physostigma is required. The pupil is contracted.

**Agaricus.**—In spasm of the ciliary muscle especially if associated with spasm of the lids or general chorea. *Twitchings of the eyelids.*

**Lilium tig.**—Spasm of the accommodation in low degrees of myopic astigmatism, when the cylindrical glasses are not worn with comfort.

Nux, Puls. and Sulph. have also been used with benefit, as may any of that class of remedies denominated as antispasmodics.

**Irido-choroiditis** (*Irido-cyclitis*).—Owing to the fact that the iris, ciliary body and choroid form one continuous tissue, any in-

flammation involving one structure is prone to extend through the whole uveal tract. There are in irido-choroiditis, as in both iritis and cyclitis, three pathological changes that may occur, viz.: Plastic, serous and suppurative, each taking on the same changes as have already been detailed under the iris. Clinically the disease may be divided into two forms.

The first form is the result of an iritis in which there has been posterior synechiæ, with exclusion of the pupil. In this the pupil may remain clear, but there is soon noticed a gradual bulging forward of the iris, in one portion, in knob-like protuberances which may be confined there or extend, involving nearly the whole iris. The bulging is due to an accumulation of fluid in the posterior chamber and occurs in spots, because the inflammation of the iris has weakened the tissue at these points. The iris is discolored, its fibrillæ appear stretched and its veins are enlarged and tortuous in their course. The tension soon becomes increased, but, as the disease advances toward an atrophied ball, becomes diminished. The vitreous is diffusely clouded, there is ciliary injection, considerable pain, which is usually worse at night; the eyeball very sensitive to touch and the anterior chamber is shallow, due to the bulging of the iris.

The second form of irido-choroiditis may be called a parenchymatous variety; as there is a considerable swelling and proliferation of the connective tissue, with an engorgement of the vessels throughout the whole uveal tract. There is occlusion of the pupil and gummata may be found. A false membrane, tough and tenacious, forms behind the iris and may extend back over the ciliary processes and choroid. This membrane becomes organized, adheres closely to the capsule of the lens and may undergo secondary contraction, causing possibly a rupture of the capsule of the lens or detachment of the ciliary body. In the later stages the retina may be detached and the plastic exudation on the choroid may become cartilaginous or bony.

In this form there is no bulging. The iris is perfectly straight, though it may be pressed forward, with occlusion of the pupil. The anterior chamber is shallow. The iris is discolored, appearing of a dirty-red; its tissue is stretched, and large vessels are seen coursing across it. The tension is increased at first and later diminished. The vision is destroyed, and, when it is lost early in

the disease, the choroid is probably the seat of the original inflammation, as when the disease commences in the iris the loss of vision does not come on as rapidly.

**COURSE.**—Irido-choroiditis is usually chronic in its course and the disease generally terminates in an atrophy of the eyeball. In rare cases it may, however, come to a standstill, the form of the eye be saved and still more rarely some vision be restored.

**CAUSES.**—The most frequent causes are the adhesions between the iris and lens, which result in frequent recurring attacks of iritis with more and stronger adhesions until there becomes an occlusion of the pupil, and, if then another attack of iritis occurs, it will almost inevitably lead to an involvement of the ciliary body and choroid. Trousseau\* describes a peculiar form of irido-choroiditis with hypopyon recurring regularly a few days before the menses and disappearing in a few days. The condition lasted for a long time, extending through the period of one pregnancy, ceasing with the menses during gestation and returning again after pregnancy. Similar cases were reported by others. Irido-choroiditis may also arise from injuries or wounds of the eye, as from foreign bodies, after operations, especially cataract extractions. It also is apt to occur as sympathetic ophthalmia in consequence of an injury to the other eye.

**PROGNOSIS.**—As a rule the prognosis in irido-choroiditis is unfavorable, but depends somewhat upon the extent of the intra-ocular changes. If seen early, before the vision and field of vision have become much impaired and there are but slight changes in the iris, it may be more favorable.

**TREATMENT.**—Our first object should be to prevent the disease, if possible, by properly treating every case of iritis, so that no posterior synechiæ may remain to cause inflammation. In order to do this and also to prevent or break up adhesions which may tend to form between the iris and lens, Atropine should be energetically employed as early as possible and continued during the course of the disease, unless there is exclusion or occlusion of the pupil, where it will be of little service. Leplat† reports several cases of irido-cyclitis in elderly people and cautions against the use of Atropine in such cases where the tension is increased, and claims better results are to be had from using Eserine, and, if necessary,

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\* Soc. d'Opht de Paris, June 3, 1890.

† Ann. de la Soc. méd.-chir., de Liège, 1889.



puncture, combined with subcutaneous injections of Pilocarpine. If we have to deal with that form of irido-choroiditis in which the iris is bulged forward in knob-like protuberances, with complete adhesion of the pupillary edge of the iris to the lens, an *iridectomy* is indicated; but if it is the parenchymatous variety, with adhesion of the whole of the posterior surface of the iris to the lens, iridectomy will do more harm than good. If a foreign body should be the cause of the inflammation, it must be removed if possible, though when the injury in the ciliary region is very great, it is better to enucleate the eye in order to prevent trouble in the other. If the inflammation of the uveal tract is caused by sympathetic irritation from an injured eye—and this is the most common form of sympathetic ophthalmia—the injured eye, especially if sight is lost, should be removed upon the first symptoms of irritation or as early as possible, unless the inflammatory process is very severe, when it may be better to wait until it has subsided in some degree. If there is some sight in the injured eye, it is often difficult to decide whether enucleation is advisable or not. As a rule, an eye that has been lost from any cause and which remains painful, even if there are no symptoms of irritation in the healthy eye, should be removed. The irritation being probably transmitted by the ciliary nerves, division of these nerves (optico-ciliary neurotomy) has been recently proposed as a substitute for enucleation. It may be adapted to rare cases.

In old cases, in which the lens has become cataractous, it should be removed.

In the treatment of all forms of inflammation of the uveal tract *complete rest* of the eye for a long period must be insisted upon. In acute cases the patient should be confined to the house and treated as for iritis. In chronic cases it is better to allow moderate exercise in the open air, with the eyes protected by a bandage or colored glasses. The diet should be nutritious and generous, especially if the patient is feeble and ill-nourished.

The chief reliance must be placed upon internal medication, but for special indications refer to the therapeutics of iritis and choroiditis. The following remedies, however, have been more commonly used with advantage and would be among the first suggested to our minds: *Rhus*, *Gels.*, *Kali iod.*, *Bry.*, *Merc. corr.* and *iod.*, *Bell.*, *Sil.*, *Hepar*, *Apis*, *Ars.*, *Asaf.*, *Aur.*, *Prunus spin.*, *Sulph.*, and *Thuja*.

## CHAPTER XVI.

### Sympathetic Ophthalmia.

Numerous affections of the eye are supposed to be due to a pre-existing inflammatory condition of the other eye and hence are called *sympathetic*. The most frequent form of sympathetic inflammation is that of irido-cyclitis, or irido-choroiditis. It is claimed by many writers that we may have a sympathetic iritis, keratitis, choroiditis, neuritis, retinitis, etc. Fuchs and some others, however, question if these diseases are the result of sympathetic involvement. Glaucoma even has been considered by some as possibly occurring from sympathetic irritation, although this is now disputed by the best authorities. As the disease may assume so many varying forms and may result in pathological changes in nearly all the structures of the eye, a special study of its pathology is therefore too complex to be undertaken here. We will, consequently, content ourselves with simply referring to the pathological processes detailed under the study of the other diseases and especially those of the uveal tract. This disease, in its more serious form, is of the greatest importance, for, if not cut short in its earlier stages, it almost inevitably leads to blindness.

The disease has what may be termed a prodromal stage, during which it is called *sympathetic irritation*. At this time the patient complains that the eye soon grows tired on using it. There is more or less sensitiveness to light, lachrymation and slight pericorneal redness. The most important symptoms at this period are, a failure in the vision and a diminution in the range of accommodation, owing to the affection commencing usually in the ciliary body. During this stage there is also apt to be found a more or less sensitive spot in the diseased eye. These symptoms of slight irritation of the eye may exist for a long period, or possibly might never lead to the dreaded sympathetic inflammation, but as a rule there is a gradual increase of the pain and cloudiness of the aque-

ous with a decrease of the visual acuity, as the stage of sympathetic inflammation sets in. Sympathetic ophthalmia may also set in without any of the previous symptoms of sympathetic irritation.

**SYMPTOMS.**—There is a loss of vision, due to haziness of the vitreous, which in the early stages is diffuse, but later we find large opacities floating about. Photophobia, lachrymation and ciliary neuralgia are present in varying degrees in different cases. The ciliary region is very sensitive to touch. The range of accommodation, when it can be tested, is much diminished. There may be ciliary injection, or chemosis and the lids may be red and swollen. On examination of the eye we find the aqueous is hazy, due to the exudation into the aqueous from the ciliary processes, and this exudation may be deposited in masses on the endothelial layer of the cornea. The exudation extends into the iris and we have posterior synechiæ, which form very rapidly, even resulting in complete exclusion within twenty-four hours, but may be more gradual. As the exudation goes on the iris becomes very much swollen, a false membrane forms attaching it to the lens throughout its entire extent, resulting in complete occlusion of the pupil. There is a venous engorgement of the iris, and its entire structure becomes degenerated. The anterior chamber becomes shallow, the opacities in the vitreous increase all the time, the choroid becomes affected and we have an inflammation of both the choroid and retina. The periphery of the iris is drawn back and its pupillary edge, together with the lens, is pushed forward. Vision at last becomes entirely lost. The tension is increased during the early stages, but later becomes diminished. The field of vision becomes contracted very early in the course of the disease.

The foregoing describes a marked or severe form of sympathetic inflammation, but we may have a more mild type of the disease, which assumes a serous rather than a plastic form of inflammation. In this there will be some pericorneal injection, the iris somewhat discolored, with a few slight adhesions and the sight slightly reduced. In some cases there may be a papillitis or neuro-retinitis, and in these light cases the eye may entirely recover. Other more rare conditions, such as conjunctivitis, keratitis, etc., have been reported as due to sympathetic irritation and have been relieved upon removal of the diseased or exciting eye.

CAUSES.—The most frequent causes of sympathetic inflammation are foreign bodies and injuries, especially when occurring in the ciliary region; operations at the corneo-scleral junction, as in cataract extractions, contraction of scars, or rupture of the sclera at the ciliary region, previous inflammations of the eye where the eye has become atrophied and especially when accompanied by chalky or bony formations within the eye, intra-ocular hæmorrhages or contusions of the eye, prolapse of the iris and anterior synechiæ, external irritation of an atrophied ball, as when an artificial eye is worn upon a shrunken stump, and in fact any eye that has been lost and is painful may awaken a dormant tendency to sympathetic inflammation.

The period during which there is a danger of transmission of sympathetic inflammation varies from two weeks to thirty years; the most frequent period, however, seems to be from four to eight weeks. There is, then, practically no period during which an injured or diseased eye may not be the cause of sympathetic irritation of its fellow. From the statistics of this disease by Gunn and others there seems to be no difference in the result or severity of the sympathetic inflammation, whether there is a short or a long interval between the primary lesion and the onset of the sympathetic disease of the other eye. According to some there is a greater tendency to sympathetic ophthalmia in young individuals, while others hold that there is less. It is also claimed by some that it never occurs unless there is a perforating lesion of the exciting eye; or, at any rate, that it is extremely rare.

As to the method of transmission of the sympathetic irritation very much has been written and many experiments made, still the exact mode is far from being definitely settled. The condition, it seems to us, from the experiments of the various investigators of this subject, may be transmitted either through the ciliary or the optic nerves, with the weight of the evidence in favor of the former.

Mackenzie in 1840, and followed later by Alt, Leber and Deutschmann, by means of experiments and microscopic examinations, have argued in favor of the optic nerve being the path along which the affection extends. Deutschmann\* made experiments upon rabbits, first by injections of spores of the *aspergillus fumi-*

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\* v. Graefe's Archiv. für Ophthalmologie, xxviii., 2; xxix., 4; xxx., 4.



gatus into the vitreous, with the result of causing choroido-iritis in the injected eye, and four weeks later the same condition, together with opacities in the vitreous, was found in the other eye. Microscopic examination revealed an interstitial neuritis extending up to the chiasm and down to the other eye by way of the optic nerve. Later he resorted to the pus organisms for the inoculating material and made injections of a suspension of staphylococcus pyogenes aureus. Subsequent microscopic examination reveals purulent infiltration of the optic nerve, with diminishing intensity up to the chiasm, and then with increasing intensity down to the other eye. He, therefore, concludes that sympathetic ophthalmia is propagated through the optic nerve. A few years later Deutschmann\* published his views in a very complete paper and claims that the disease is a process of microphytic origin, passing from one eye to the other through the optic nerve apparatus and suggests that the name *ophthalmia migratoria* better expresses the character of the disease than does sympathetic ophthalmia. He also claims that it should be kept separate from an affection of the other eye dependent upon an irritation of the ciliary nerves of the first eye, and which should be called reflex irritation. In opposition to these theories of optic nerve transmission we find H. Muller† pronouncing in favor of the ciliary nerves. Randolph‡ details numerous exhaustive experiments upon both dogs and rabbits, made with the expectancy of confirming Deutschmann's results, but in no instance was sympathetic ophthalmia a sequel of the operation, and hence his results were entirely negative so far as confirming those obtained by Deutschmann. Galezowski§ thinks the inflammation is carried from one eye to the other through the ciliary nerves and their lymph channels and not through the optic nerve. Further, the fact that sympathetic ophthalmia is most frequently apt to occur after wounds in the ciliary region, and also that it never, or very rarely, occurs in suppurative diseases of the eye, such as panophthalmitis, where the ciliary nerves are destroyed, leads us to think that the most frequent path of the transmission is through the ciliary nerves.

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\* On Ophthalmia Migratoria (sympathetic ophthalmia) Hamburg and Leipzig, 1889.

† Archiv. Ophthal. (Graefe), vol. iv., 1, 1858.

‡ Archiv. Ophthal., June, 1888, p. 188.

§ Soc. d'Ophth. de Paris, October 7, 1890.

PROGNOSIS.—In the prodromal stage, or that of sympathetic irritation, the prognosis may always be considered favorable; but if later, after exudation has taken place, it is unfavorable, as in the majority of cases the disease leads to blindness. The prognosis is always more favorable when the course of the disease is slow, rather than rapid, and more favorable in the serous than in the plastic form.

TREATMENT.—Our attention should first be directed to the exciting eye, and in all eyes where we find it at all irritable, sensitive to touch and *the vision lost*, an enucleation of that eye should *at once be made*. If the affected eye is only in the stage of prodromal irritation, the removal of the eye which is creating the sympathetic irritation will usually result in at once checking the disease and restoring the eye to its normal condition. If the exciting eye contains a foreign body which cannot be independently removed and is itself undergoing inflammatory changes, it should be removed, even though possessing more or less vision, as that eye will probably be lost, and, by its removal, the other may be saved. The advisability of removing an exciting eye when it has a certain amount of vision, in a plastic form of sympathetic ophthalmia, is a decidedly delicate question, because there is a very grave probability of losing the sympathetic eye, while the eye originally causing the irritation *may* come out with the best vision.

Enucleation should always be practiced in the irritative stage, if possible, as often, if delayed until the sympathetic eye has become actively inflamed, its removal then will not serve to check the progress of the disease. In all cases where one eye has become lost, and especially when from injuries or wounds in the ciliary region, the patient should be thoroughly cautioned as to the possibility of its serving *at any time* to cause destruction of the other eye from sympathetic ophthalmia and its removal advised. If enucleation is not submitted to at this time, they should be warned of the importance of immediate attention upon the slightest sign of any pain or irritation.

*Enucleation* or *Evisceration* as described on page 271 is the best operative measure for sympathetic ophthalmia.

*Optico-Ciliary Neurectomy*.—The operation of division of the optic and ciliary nerves behind the eyeball has been advised

and practiced by some. Its only claimed value is in the retention of the eye. Schweigger and others recommend it as a preventive measure; but, as a remedy in the inflammatory type, it is untrustworthy, and even in the stage of irritation it ranks below enucleation. The operation is best performed by division of the internal rectus muscle, and dissecting back with the blunt scissors to the vicinity of the optic nerve. Then, by rotating the globe outward, insert a strabismus hook, with which you catch up the optic nerve and drag it out as far as possible. The scissors are now inserted over the hook and the nerve severed as near to the apex of the orbit as possible; the nerve is then drawn out, and, with the forceps and scissors, cut off all the nerve tissue possible close to the eye. The eye is then restored to its place and the muscle and conjunctival wound closed with sutures. Profuse hæmorrhage and reaction are apt to follow from this operation.

In addition to the operative measures when an eye is sympathetically inflamed it should be given the same treatment as that for irido-choroiditis. The use of Atropine to dilate the pupil and relieve the pain may be tried, if there is not an exclusion of the pupil, when it had better not be used. The patient should be kept at rest in a darkened room. Hot fomentations or the cotton pad may be applied. Ice has been employed in some cases, though as a rule it is not advisable. Recently the sub-conjunctival injection of the bichloride of mercury has been greatly lauded by Darier and others in diseases of the uveal tract. My own experience has given me no beneficial results from these injections. Iridectomy has been recommended, but sclerotomy is better, if the tension is increased and the eye painful, but it is far better to make no operation upon the affected eye during the inflammatory stage and not until long after it has become quiescent, as there is grave danger of lighting up another attack. The remedies most apt to be of value are Bell., Merc., Sil., Kali iod., Rhus tox. and Bry. For special indications see Part II.

## CHAPTER XVII.

## Diseases of the Choroid.

**Anatomy.**—The choroid is that portion of the uveal tract extending from the ciliary body backward to the optic nerve. It lies between the retina and the sclera and is principally composed of blood-vessels and pigment. The choroid may be considered the nutrient membrane for the interior structure of the eyeball, and consists of four layers. The outermost layer is composed of loose connective tissue and of irregular shaped pigment cells; these connective tissue fibres extend into, and are derived from, the sclerotic, and the meshes of these fibres form spaces conveying lymph. This lymph space is held to be in direct communication with that of the capsule of Tenon and the other lymph-spaces of the eyeball. In separating the choroid from the sclera, these fibres are necessarily torn, and that portion remaining adherent to the choroid has been termed the lamina supra-choroidea, and that part remaining attached to the sclerotic, the lamina fusca. The next layer is that of the tunica vasculosa—a layer of large blood-vessels which forms a large portion of the parenchyma of the choroid. The third layer, known as the chorio-capillaris, is made up of the finer branches or capillaries of the arteries and veins of the tunica vasculosa. These two layers, together with a small amount of connective tissue, some elastic fibrillæ, and cells, both pigmented and unpigmented, form the parenchyma of the choroid. The blood supply of the choroid (see Fig. 65) is chiefly derived from the short posterior ciliary arteries, which pierce the sclerotic obliquely and enter the choroid and branch off, anastomosing with the long posterior and the anterior ciliary arteries. The veins, beginning as capillaries in the chorio-capillaris, take, in the tunica vasculosa, a whorl-like form and uniting into from four to six large trunks called the venæ vorticosæ, pass obliquely



through the sclera at about the equatorial region of the eye and empty in the ophthalmic vein. A small amount of the blood from the anterior part of the choroid passes out through the anterior ciliary veins. The parenchyma of the choroid also contains a great many nerves coming from the short and long ciliary nerves and which form in the choroid fine plexuses of nerves with many ganglionic cells. The most internal layer of the choroid is called the lamina vitrea or elastica. It is an elastic and perfectly transparent membrane, upon which the (uveal) pigmented epithelium lies. This pigmented epithelium, lying between the choroid and retina belongs to the latter but remains attached to the choroid when the retina is removed from the eye. Nearly every pathological condition of the choroid exerts an influence upon this layer of pigment, while important changes are apt to occur in the retina without any alteration in these pigmented epithelial cells. As it is anatomically a part of the retina, we will consider its further description under that membrane.

**Hyperæmia of the Choroid.**—Owing to the general continuity of tissue with the ciliary body and iris, and to its excessive vascularity, the choroid is necessarily very apt to become hyperæmic from almost any inflammatory changes of the eye. In fact, hyperæmia of the choroid undoubtedly is present more often than is generally recognized. The diagnosis is difficult to make on account of the pigment layer in front of it, and is especially so in dark people. In blondes and albinos the choroidal vessels may be seen and the diagnosis aided. The only symptoms, however, of diagnostic value are a diffuse hyperæmia of the optic disc and a woolly appearance of the pigment layer. Hyperæmia of the choroid is distinguished from a hyperæmia of the optic nerve and retina by the fact that in the former the redness of the disc is diffuse and its outlines are sharp and well defined, while in hyperæmia of the nerve and retina the outlines of the disc are ill-defined and the redness has more of a striated appearance. The treatment is detailed under that of choroiditis in general.

**Choroiditis.**—The appearance of the healthy choroid must first be carefully studied before one can fully appreciate changes, whether inflammatory or otherwise, of its structure. The color

of the fundus of the eye, when examined with the ophthalmoscope, varies in different individuals according to the amount of pigment granules contained within the pigment or uveal layer. In fair persons we find the fundus appearing of a yellowish-red color and the vessels of the choroid can usually be plainly seen (See Chromo Lithograph, Plate 11, Fig. 1.); in darker persons and negroes the color varies from a brownish red to a slate-color and the choroidal vessels are entirely hidden by the pigment layer. The color and intensity of the light used and the extent of the dilatation of the pupil also serve to affect somewhat the color of the fundus.

Great alteration may take place in the choroid and nothing be discernible; in fact, in some cases it is only when the retinal pigment-cells have become affected by the pathological process that ophthalmoscopic changes are observed. Hence, characteristic appearances of choroiditis are only seen when the retina has become affected as well; that is, when the disease has become a choroido-retinitis. Clinically, however, the disease is still a choroiditis, even though the outer layer of the retina has become secondarily affected. In choroiditis the eye shows no external evidence of disease (except in suppurative choroiditis), and is only manifested to the patient by a loss of vision and to the physician by the ophthalmoscopic appearance. Inflammation of the choroid may be the same as in other divisions of the uveal tract, of a serous, plastic or purulent type.

**Choroiditis Serosa.**—Is considered by some authorities as a form of glaucoma. The consideration of *serous* inflammations of the uveal tract is a subject of great disagreement among the various authorities. We have referred to each disease separately because each division of the uvea, the iris, ciliary body, and choroid are certainly susceptible to separate involvement by other pathological processes, and we cannot conceive why there may not be a serous inflammation of either structure alone. As a rule, however, we usually find a serous inflammation involving the choroid, ciliary body and iris at the same time, and while it may commence in one structure it probably rapidly extends to the others and perhaps should more properly be termed a *serous uveitis*. As the cornea is also usually affected in serous uveitis, it

may be that the disease described as descemetitis is merely a manifestation of the similar process in the cornea through a direct extension by continuity of tissue.

**PATHOLOGY.**—There is at first a general or localized hyperæmia, especially affecting the veins of the choroid. Following the hyperæmia there is either a serous or sero-fibrinous exudation, which is found extending inward either into the pigment layer of the retina, between the retina and vitreous, or into the vitreous body itself. The increased secretion of a serous fluid within the eye may, when the channels of excretion have become altered or obliterated, result in glaucomatous symptoms.

**SYMPTOMS.**—There may be slight ciliary injection and the dotted appearance of the cornea, as in serous iritis. The aqueous and vitreous humors are slightly hazy, causing a general indistinct and hazy appearance of the fundus. Fine floating opacities may be discovered in the vitreous and vision is impaired in proportion to the opacity of the media. The tension should always be examined, as it is very liable to become increased and glaucomatous symptoms set in. Serous choroiditis seems often to be associated with syphilis, rheumatism or gout, and generally occurs as a complication of serous iritis.

The *treatment* is the same as with other inflammations of the choroid, but the use of remedies, especially Gels. and Bry., is very essential.

**Choroiditis Disseminata Simplex.**—Simple disseminated choroiditis is of the plastic form of inflammation.

**PATHOLOGY.**—Plastic choroiditis never attacks the whole choroid, but takes place in small patches, which may coalesce and grow larger. The hyperæmia in this form is followed by a fibro-cellular exudation into the stroma of the choroid, and we find numerous small nodules composed of a fibrinous substance and round cells. There is also a lymphoid infiltration along the vessels, which makes them appear as yellowish-white striæ. The retina and pigment layer at this stage are normal, or only slightly elevated by the underlying infiltration. Absorption may take place at this stage, leaving the stroma of the choroid normal. If the process goes on, there is a proliferation of the pigment layer over the nodules, the exudation presses more and more upon the

retina, the layer of rods and cones become involved and the tissue of the retina is affected. The proliferation of pigment extends into the external granular layer, and, when the exudation extends deeply into the retina, the radial fibres of the retina run into the exudation and become united with the fibrillated structure of the nodule. In the later stages the cell elements gradually disappear and the fibres retract, leaving a depressed retinal scar. The cells covering the exudation lose their pigment and may be totally destroyed. Their pigment, having thus been freed, is taken up by the cells at the periphery of the patch of exudation, and then we have the characteristic white atrophic spot surrounded by a dark pigmented border.

SYMPTOMS.—The subjective symptoms of this disease are not at all prominent or characteristic. They will simply complain that their eyes feel a little weak and that the vision does not seem quite as clear as formerly. Very frequently we find, upon ophthalmoscopic examination, extensive choroidal changes with little or no loss of the visual acuity. Randolph\* reports two cases of very pronounced disseminate choroiditis with preservation of normal acuteness of vision. Often there is some night-blindness in those cases of marked choroidal changes, even when the vision is good. Slight scotomata are frequently complained of, especially in the later stages, and upon testing the field of vision we are apt to find it somewhat contracted. All the subjective symptoms are apt to be more marked during the stage of exudation than in the atrophic stages of the disease. The extent of the visual disturbances and the other symptoms depend, in a great measure, upon the location of the disease—if near the periphery, the effect is of course much less than when occurring at or near the macula. As the disease advances toward the macula the patient may complain that objects looked at appear distorted (*metamorphopsia*). This is due to the exudation causing a change in the relative position of the percipient elements of the retina. Again, all objects may appear diminished in size (*micropsia*) or unnaturally enlarged (*macropsia*). In micropsia there is, owing to a fresh exudation, a separation of the retinal elements at the point of such an exudation, and the image of any object falling on such a point affects a smaller number of retinal elements than normal and the

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\* Archiv. Ophthal., vol. xviii., 4, 1889.



object appears smaller. In macropsia, on the other hand, there is a greater approximation of the retinal elements, due to the contraction of an old exudation or some other atrophic change, and objects appear enlarged. Hyperæmia of the disc and haziness of the vitreous may sometimes be present when the disease has reached the neighborhood of the optic disc; or, on the other hand, if the disease extends far forward, it may result in some affection of the ciliary body or iris.

The most characteristic indications of choroiditis are, however, only to be determined by an ophthalmoscopic examination. In the early stages, if occurring in dark persons, it is difficult or impossible, owing to the greater amount of normal pigment, to recognize the first changes. If, however, the patient is a blonde, there is first seen a slight injection of the choroid in spots. Following this, in the stage of exudation, there may be seen numerous yellowish-red nodules, of a more or less circular shape, varying in size, scattered about through the equator of the eye. When the disease is acute, there may be slight haziness of the retina around the optic nerve, and possibly slight haziness of the vitreous. After a longer or shorter period the color of these plaques of exudation changes to a yellow and later to a white, or a bluish-white appearance, and, owing to the pigment proliferation around their borders, become surrounded by black masses of pigment. (See Chromo-Lithograph, Plate II., Fig. 4). The stage of the disease is determined by the appearances of these patches, which are, in the atrophic stages, white in color—due to the showing through of the sclera and to the cicatricial tissue itself, they have irregular margins, more or less surrounded by pigment, and choroidal vessels may be seen here and there passing through the white spot. In the stage of exudation the choroidal vessels are entirely hidden and the color of the patches are of a yellowish red, with no pigment. In atrophy there is a depression or sinking of the patch, while in exudation there is an elevation. Frequently there may be even in the same eye all stages of the disease.

**Choroiditis Areolaris.**—This is only a variety of the disseminate form just described, in which the nodules have more of an areolar structure and with great proliferation of the pigment over the nodule. The patches in areolar choroiditis are usually

larger, of a round or oval shape, and their location is especially around the optic nerve and the macula. The recent patches appear as very dark masses of pigment. As they grow older they gradually lose their dark color and finally appear white, surrounded by a black ring. In this form the pigment spots and exudation bear a certain relation to each other; the pigment spots are first noticed, and, as it progresses, the centre of the patch becomes lighter, of a yellowish-white appearance, and gradually goes on to a clear white spot surrounded by pigment. The choroid between the patches remains perfectly healthy, and, although the location of the disease is all around the macula, it is usually last affected; but, when it is involved, it often becomes affected suddenly. This form is especially found in young persons and will exist for a long time with good vision—the macula rarely being involved before middle life.

**Choroiditis Circumscripta**, or *Choroido-retinitis Centralis*, is simply another form of disseminate choroiditis occurring in and near the macula. There is in this usually the development of a single nodule, but very rarely there may be two or three, consisting of a connective tissue frame-work, with cells and agglomerations of pigment. It arises in the choroid, but extends into the layers of the retina, which are raised at the point of the nodule, but are perfectly normal and healthy around it, thus proving the affection of the retina to be due merely to pressure and not to inflammation of its own tissue. It goes on to atrophy with shrinking of the cicatrix, which draws the retina back along with it. (Fig. 75.)

The disease is always uniform in that scattered nodules are never found, and, while there may be more than one nodule, they are always closely arranged around the macula. An ophthalmoscopic examination shows at first a reddish-yellow, or later a bright yellow, round or oval spot at the macula. It is in the earlier stages elevated, well defined and may be vascular, while in the later stages it becomes whiter as it goes over into atrophy and then a depression occurs. This form of choroiditis affects vision by causing a very pronounced scotoma, which is persistent and especially annoying in the earlier stages; metamorphopsia is also usually complained of.

**Choroiditis Syphilitica**, or *Choroido-retinitis Syphilitica*, is still another form of plastic choroiditis, the pathological changes in which are the same in the late stages as already described under choroiditis disseminata and choroiditis circumscripta (Fig. 75). In the first stage the disease attacks the epithelial layers, the retina and the vitreous. This form of choroidal affection, if not invariably, is, in a large majority of cases, a manifestation of syphilis, and generally appears in the late secondary or early tertiary stage of syphilis. It seems to be most apt to occur in cases where syphilis has been acquired late in life, is most frequently found affecting both eyes and is sometimes preceded by an attack of iritis.

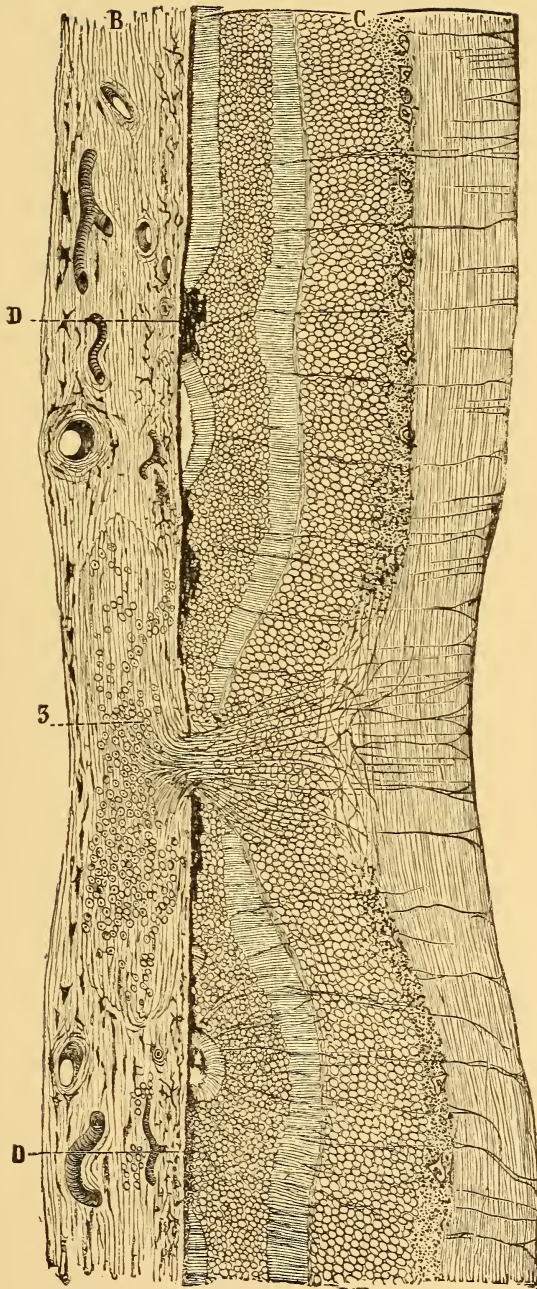
**SYMPTOMS.**—The characteristic symptoms of this affection are the fine, dust-like opacities of the vitreous, seen upon an examination by the direct method, with a weak illumination (after causing the eye to move rapidly upward and downward), to rise like dust before the wind. The opacities in some cases may form flakes or filaments, which, however, are seen to float up and down in a medium full of the characteristic dust. In certain cases these coarser opacities may increase greatly in size, but the peculiar dust appearance is always present and remains throughout the whole course of the disease. Another peculiarity of this dust-like haziness of the vitreous is that it varies considerably in amount from time to time during the course of the affection, and, owing to this, the vision will improve or diminish often within a few hours. When the vitreous dust is not sufficiently dense to obscure a view of the fundus, we will often see a hyperæmic condition of the disc, an indistinctness of its outlines and a slight haziness of the retina.

Hemeralopia, or night-blindness, is almost universally present among patients suffering from double specific choroiditis, and, in all cases where but one eye is affected, the size of objects seen with the diseased eye, when compared with the healthy, appear small (micropsia). Another characteristic sign is the subjective perception of luminosities (phosphenes), generally seen as sparkling scotoma and are always seen upon entering a bright light. The vision is always very much reduced in this form of choroiditis.

**COURSE.**—This form of choroiditis may run an acute course, recovering with nearly perfect vision and leaving no trace behind.



FIG. 75.



Choroido-retinitis. *B*, choroid; *C*, retina; 3, choroidal nodule, to which the retina is attached by its radial fibres, cicatricial contraction well advanced. *DD*, points showing a reunion of the choroid and retina.



More frequently, however, there remains some impairment of vision due to the persistence of vitreous opacities, which may be very dense, or to the changes in the choroid, similar to those in the disseminate form, which may develop gradually in the later stages of the disease.

CAUSES.—Choroiditis of all forms, in a very large proportion of cases, is due to syphilis, and in those cases not resulting from that disease there seems to be a decided hereditary trait. Scrofula, chlorosis, anæmia and similar general disorders of nutrition may cause choroiditis. Other cases are connected with, or extend from, a progressive posterior staphyloma. The disseminate and central forms of choroiditis may occur spontaneously, so far as any direct cause can be determined, while the areolar form seems to occur frequently in tutors, governesses and others of whom it may be said their occupation requires what may be called an intelligent use of the eyes. Gould\* reports cases of central choroido-retinitis, which he attributes to ametropia, believing that chronic uncorrected ametropia may result in permanent lesion in the region of the macula, with pigmentary changes, which he thinks may result from straining of the retina in an effort to secure a clear image.

TREATMENT.—Under this heading we shall consider the treatment of the several forms of choroiditis already described.

Rest in a darkened room for a long period has been recommended for inflammation of the choroid. This, together with bandaging of the eye, will answer in some cases of acute serous inflammation, but its tendency to impair the general health usually renders it unsafe, especially in chronic cases and in the disseminate form of inflammation, in which it is far wiser to allow moderate exercise in the open air, with the eyes protected from the bright light by smoked or blue glasses. *Complete rest* of the eyes from all work should always be required. Atropine may be useful in some cases, as it paralyzes the tensor choroidea, thus preventing any movement of the inflamed tissue upon change of light. In the serous variety, if the intra-ocular tension becomes increased, frequent paracentesis may be performed, or if this does not suffice an iridectomy must be made. Abstinence from all stimulants and proper hygienic measures are necessary.

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\*Archiv. Ophthal., vol. xix., 1, 1890.

**Aurum.**—Choroiditis, with or without retinal complication, especially if there is *exudation into the choroid and retina or into the vitreous*, causing haziness of the vitreous. We may have sensitiveness to light and touch, ciliary injection and some pressive pain in the eye from above downward or from without inward, aggravated on touch, or pain in the bones around the eye. A general feeling of malaise and depression of spirits is often present.

**Kali iod.**—It is *the* remedy for *syphilitic choroido-retinitis* characterized by great haziness and exudation into the vitreous, which may vary from day to day; also for *syphilitic disseminate choroiditis*, with little or no haziness of vitreous. Much benefit has been derived from its use in simple disseminate choroiditis even when the atrophic changes in the choroid are far advanced or when the whole uveal tract has become involved.

**Mercurius.**—The various preparations are used, according to special indications, though the corrosivus or solubis is more often needed. Mercury is of great value in choroiditis, especially *disseminate*, and when the *iris is also involved* (irido-choroiditis). The syphilitic dyscrasia would particularly point to its use, though it is indicated in non-syphilitic cases. *The pains are usually intense both in and around the eye*, varying to a great extent in character. The *nocturnal aggravation* of all the symptoms is of importance in the selection of this remedy, as well as the general condition of the patient.

**Phosphorus.**—Both serous and disseminate choroiditis have been benefited, especially when accompanied by *photopsies and chromopsies of various shapes and colors (red predominating)*. We find in the proving of Phosphorus, that it has produced *hyperæmia of the choroid*, and experience shows that it is often adapted to this condition. When sexual excesses seem to be the cause of the trouble this remedy is indicated. The optic nerve and even retina may show decided hyperæmia. Black spots pass before the vision. There may be some dread of light. The eyes seem *better in the twilight*. Particularly suitable to lean, slender persons, and especially if complicated with cough, etc.

**Bryonia.**—*Serous choroiditis*, or inflammation of the uveal tract, following rheumatic iritis. From *serous* infiltration into the vitreous the haziness is often so great as to seriously interfere with our view of the fundus. The vessels of the fundus are congested; the

pupils may be somewhat dilated and the tension increased. *The eyeball feels sore to touch and motion, while darting pains through the eye into the head* are usually present.

**Gelsemium.**—It may be of service in the plastic forms of choroiditis, but its grand sphere of action is in *serous inflammation of the uveal tract*, especially if anterior to the equator, with great haziness of the humors. The impairment of vision will be great; may be slow and gradual or subject to sudden changes. The haziness of the vitreous is usually fine; the tension may be increased and pupil dilated. The iris may be involved, with tendency to posterior synechiæ. The pain is dull, aching, pressing, in and over the eyes; may extend to occiput and be relieved by hot applications. Eyeball sore to touch. Heaviness of the lids. Headache, general depression, loss of muscular tone, fever and thirstlessness.

**Belladonna.**—An important remedy in *hyperæmia* or acute inflammatory conditions of the choroid, particularly of the disseminate variety and accompanied by congestive headaches. The optic disc is of a deep red color and the retinal vessels enlarged, especially the veins. The pupil is slightly dilated, ciliary injection usually marked and the eyes sensitive to light, with full feeling as if pressed out of the head. Disturbances of the vision are often present, as halo around the light and various flashes of light and sparks. The headache and constitutional symptoms decide our choice.

**Kali mur.**—The benefit derived from its use in the absorption of exudations has been demonstrated in exudative choroiditis.

**Nux vom.**—In disseminate choroiditis occurring in persons addicted to the use of stimulants, also when atrophic changes are even far advanced, Nux often seems to materially improve the degree of vision. The eyes are especially weak and *sensitive to light in the morning*. Gastric derangements and other constitutional symptoms are of great importance in selecting this drug.

**Prunus spin.**—Inflammation of the choroid, either with or without iritic or retinal complication. Haziness of the vitreous and other common symptoms of the disease are present, but the characteristic indication will be found in the *pain, which is usually severe, as if the eyeball were being pressed asunder, or else sharp, shooting and cutting through the eye and corresponding side of the head, or crushing in character*.

**Pulsatilla.**—Hyperæmia of the choroid or sub-acute cases of choroiditis occurring in women of a mild, tearful, yielding disposition and when accompanied by amenorrhœa; also in tea drinkers who are subject to neuralgic headaches. Eye symptoms not characteristic.

**Sulphur.**—Chronic cases of choroiditis, especially if occurring in a strumous subject. *Sharp darting pains* are usually present. Often assists in clearing the vitreous and completing a cure after other remedies have been used with advantage. The hemeralopia found in some cases may be relieved.

**Veratrum vir.**—Choroiditis, especially in women with much vaso-motor disturbance. Aching pains in the eyes, becoming sharp in the evening. Photopsies. Painful menstruation and aggravation of eye symptoms at that time.

In addition to the above, the following remedies have been employed with favorable results: Acon., Arsen., Duboisin, Hepar, Jaborandi, Psor., Ruta, Sil.

**Choroiditis Suppurativa** (*Choroiditis Metastatica. Panophthalmitis, Traumatic Purulent Choroiditis*).—The characteristic feature of purulent choroiditis is an infiltration and new formation of cells in the parenchyma of the choroid, and, as the disease advances, the whole structure of the choroid and uveal tract becomes filled with round cells, and the retina and vitreous are infiltrated with pus cells. The purulent inflammation may extend outward and thus may finally result in a purulent infiltration of all the membranes of the eye (panophthalmitis). Schöbl\* describes the pathological anatomy in twenty-seven cases of panophthalmitis, and concludes that, from whatever cause it occurs, it commences as a fulminating purulent retinitis or choroiditis, or both together, and from this rapidly extends to the other coats.

**SYMPTOMS AND COURSE.**—The lids are œdematously swollen, red and puffy, the conjunctiva chemosed, and, from the inflammation of the capsule of Tenon, there is exophthalmos, with limitations in the movement of the eye. The cornea is hazy, the aqueous cloudy and hypopyon rapidly forms. There are posterior synechiæ,

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\* Archiv. Ophthal. vol. xx., 1, 1891.



the anterior chamber shallow and the tension is liable to be increased. The white reflex from the fundus is present and indicates the formation of pus within the eye. In this form of choroiditis the pain in and around the eye is usually very severe and the eye is sensitive to touch. Tension of the eye is diminished. The rapid onset and course is apt to be accompanied with high fever, vomiting and other general manifestations. Destruction of vision takes place early and the suppurative process quickly results in perforation and atrophy of the eyeball.

CAUSES.—It most frequently develops after some injury of the eyeball, where a foreign body has become lodged within the eye; or may occur from a slight perforation or incision in which possibly some infectious matter has been conveyed into the eye. Thus it may be set up by operations—after the removal of cataracts or any opening of the bulbus, in cases of purulent or infectious conditions of the eye, as in dacryocystitis, perforating ulcers, etc. It is most often found in old people and the prognosis is always unfavorable.

As a *metastatic choroiditis* it may occur in two ways. First, where it is found in connection with pyæmia, puerperal fever, typhoid, variola, malignant pustule, phlegmonous erysipelas, suppurative endocarditis, acute rheumatism, etc., the immediate cause in these cases is an embolus affecting the choroidal vessels, and this embolus undoubtedly conveys the infecting micro-organism. The choroiditis, when resulting in this way, is usually confined to but one eye, although it sometimes has been found occurring in both eyes. This form is also apt to be very rapid and acute in its destructive course. The purulent infiltration occurs first between the retina and choroid and rapidly extends, involving the whole eyeball.

The second form of metastatic infection is that found following meningitis or cerebro-spinal meningitis, and in these cases it is due to the communication between the sub-arachnoid cavity of the brain and the intervaginal space of the optic nerve, forming a direct channel for the transmission of the inflammatory products to the eye. One or both eyes may be affected, although more frequently but one. In this variety the course is not usually as acute or as purulent as in the preceding form. Thrombosis of the cerebral sinuses, associated with a thrombosis of the ophthalmic veins, may also give rise to a suppurative choroiditis.

**DIAGNOSIS.**—Rarely we may find a very sluggish form of suppurative choroiditis with no inflammatory signs which looks so much like a glioma of the retina that it is almost impossible to differentiate between them. In both, the cornea, aqueous and lens are clear, anterior chamber shallow, pupil dilated, iris and lens pushed forward, with a light colored (whitish or yellow) reflex from the pupil. The chief diagnostic sign may be the tension which early will be normal in both, but soon becomes increased in glioma, and decreased in choroiditis (or pseudo-glioma as it is also called). In choroiditis we may have a history of previous illness. The course of the disease would of course ultimately determine the diagnosis, as choroiditis leads to atrophy of the eyeball and glioma to perforation. We should never delay too long, as early enucleation offers the only chance in glioma, and as choroiditis leads to blindness nothing is lost from an enucleation in that case.

**PROGNOSIS.**—In all forms of suppurative choroiditis, from whatever cause it may arise, the prognosis is absolutely unfavorable, and when due to meningitis, pyæmia, etc., life itself is of course in danger.

**TREATMENT.**—Our first endeavor should be to save the eye if possible, and with this end in view any exciting cause must be removed. If it is due to a swollen, cataractous lens, this must be extracted; if to an orbital abscess, this must be opened; or if a foreign body is found to be the cause, as is frequently the case, we must try to remove it, unless it is too deep within the eye, when it is far better to enucleate. In cases of metastatic origin little can be done, as the general illness will usually require our main attention. Enucleation should not be performed while the inflammatory process is very pronounced, as experience has shown that it is advisable to wait before we undertake the operation until the severity of the symptoms has subsided; but if a foreign body is present within the ball, enucleation of the eye is strongly recommended after the inflammation has been subdued, for there is always danger of sympathetic irritation of the other eye.

Enucleation during panophthalmitis has been practiced and recommended by some. Rolland\* has enucleated in eighty cases without a death. He, however, does not enucleate when phosphenes indicate that the lymph sheaths of the optic nerve have be-

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\* Rec. d'ophth., 1888, No. 7.

come affected or cerebral symptoms have manifested themselves. Andrews\* reported twelve enucleations with no unfavorable symptoms. He also gives the statistics of thirty fatal cases, but believes the danger can be diminished by strict antiseptic precautions and care.

For the disease itself, in the first stage, cold or ice compresses may be used with advantage, but if the pain becomes very severe in and around the eye, especially if suppuration has commenced, more benefit will be gained from warm applications, either dry or moist. Atropine may be of advantage, early, in palliating the pain.

If the pain is very severe and the tension increased, paracentesis or an iridectomy will be found of service. If, however, suppuration has so far advanced so as to destroy the eye and the pain is intense, it is best to make a deep free incision of the eyeball at once and employ hot fomentations.

A nourishing diet, even stimulants, becomes necessary to sustain the patient's strength after suppuration has taken place.

**Rhus tox.**—The most commonly indicated remedy in panophthalmitis, whether it be of traumatic origin or not. It is useful in nearly every stage of the disease, though is particularly adapted to the first. The *lids are œdematously swollen*, spasmodically closed, and upon opening them a profuse gush of tears pours out. The *conjunctiva is œdematous*, forming a wall around the cornea, which may be slightly hazy. The iris may be swollen, pupil contracted and aqueous cloudy, while the pain in and around the eye is often severe, *especially at night* and upon any change in the weather.

**Aconite.**—*First stage*, accompanied by high fever and much thirst. *Eyelids red, swollen, hot and dry*, with much pain in the eye.

**Hepar.**—*After suppuration has begun. Eye very sensitive to touch and the pains severe and throbbing, ameliorated by warm applications.*

**Phytolacca.**—Panophthalmitis, especially if traumatic. *Lids very hard, red and swollen; chemosis and pus in the interior of the eye. Pains quite severe.*

**Apis.**—*Lids œdematous, chemosis, stinging pains through the*

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\* N. Y. Med. Jour., Dec. 29, 1888.

eye. Drowsiness and absence of thirst usually accompany the local indications.

**Arsenic.**—If the patient is very *restless* and *thirsty*, with œdema of the lids and conjunctiva, and severe *burning pain*. Arsenicum cases are similar to Rhus, though the former does not compare with the latter in degree of usefulness.

Asafoet., Bell., Merc., Sil., Sulph. and other remedies may in certain cases and stages be useful.

**Sclerotico-Choroiditis Anterior.**—In this form of choroiditis there is a participation of the sclera in the inflammatory process. The disease is generally circumscribed to a portion of the sclera and choroid in the vicinity of the iris, although it may entirely surround the cornea. It is usually chronic in its nature, the most acute cases often lasting for months, while others will run for years. The appearance resembles very closely that described under episcleritis, although the pain is apt to be more severe and the inflammation and swelling of the conjunctival tissues is more general. The inflammation may extend to the iris, causing synechiæ; or to the cornea, causing what has been called a sclerotising keratitis.

In the chronic form, staphyloma frequently results from a weakening of the sclera, due to the inflammation; it becomes thinned, presenting then a bluish or grayish-blue color. The staphyloma may be of varying size or shape, and occur either at the sclero-corneal margin or as far back as behind the ciliary region. This gradual bulging is a very slow process, extending often over a period of years and is usually unaccompanied by much pain. It seems to occur more frequently in women than in men and is most liable to occur before adult life.

The *prognosis* is always unfavorable, especially in the more chronic cases, as treatment seems to be of little value. See *Scleritis*.

**Sclerotico-Choroiditis Posterior** (*Sclerectasia Posterior*, *Staphyloma Posterior*).

**PATHOLOGY.**—The pathological changes present in posterior staphyloma are those of an atrophic choroiditis, with a gradual thinning and atrophy of the sclera. It may have small points of



exudation, especially near the macula, which have a tendency to coalesce and go on gradually to atrophy. Pigment proliferations are usually present around the edges of the crescent, especially when the condition is progressive. There may also be found fluidity and opacities in the vitreous and changes in the retina. The vitreous may be detached either at the lens or the posterior pole.

**SYMPTOMS.**—The disease is always found existing in myopic eyes, the eyeball is apt to appear prominent and its movements may be somewhat impaired. Patients will sometimes complain of a feeling of tension in the eyes and there may be some pain in or around the eye, and a tired, strained aching of the eyes when using them. In the progressive stage metamorphopsia is a most frequent symptom, and often times complaint is made of black spots floating before the vision (*muscæ volitantes*), of cloudy vision and subjective light sensations. An ophthalmoscopic examination will show the presence of a white crescent around the optic nerve, usually at its outer side (See Chromo-Lithograph, Plate II., Fig. 3); the size and shape of the crescent may vary greatly from a small, narrow rim at one side to a spot several times the diameter of the optic nerve.

The optic nerve will have a pinkish appearance, from contrast with the whiteness of the staphyloma, due to the sclerotic shining through the atrophied choroid. The retina is detached somewhat from the choroid and the retinal vessels may be seen passing across the staphyloma. Vision becomes affected by enlargement of the blind spot and there is usually some amblyopia, which may be due to the reflection of light from the white surface and to the congestion of the retina.

If the disease becomes progressive, the myopia increases, the vision is more and more impaired, the black spots before the eye increase and the optic nerve and retina become more irritable. The edges of the crescent show signs of inflammation, appear more irregular and congested; there is slight proliferation of pigment in small spots surrounding the borders of the staphyloma, which increases more and more as the disease advances, and extending especially toward the macula. These spots of pigment gradually coalesce and the centres undergo a gradual change in color until they form one large, white, atrophic spot with a nar-

row border of pigment surrounding it, similar to the changes found in disseminated choroiditis.

CAUSES.—Posterior staphyloma is considered to be mechanical in its origin. The predisposing cause being congenital and hereditary, the insertion of the optic nerve being obliquely, and to the inner side of the posterior pole of the eye, would render the outer side where the staphyloma occurs weaker, and any abnormality in this direction would increase the weakness at that point. The exciting causes are first an insufficiency of the internal recti, causing a dragging upon the eye from prolonged efforts of convergence, and results in an elongation from an increased pressure upon the eyeball. The use of the accommodation in myopic eyes is another factor in the causation of posterior staphyloma. In myopia the longitudinal fibres of the ciliary muscle are especially developed, and in the effort of accommodation there is a drawing forward of the choroid through the fibres of the tensor choroidea, which results in an increased vascularity of the choroid at its attachment around the optic nerve. In this way there is created a low form of choroiditis at that point which causes a softening and bulging of the tissue. The sclera is more vascular around the optic nerve, and any congestion there would serve to soften its tissue. An increased vascularity would tend to increase the tension, but, owing to the weakness of the sclera, it bulges instead. Bending the head forward, as is so frequently seen in myopic children, seems to increase the vascularity and so increases the staphyloma. Myopia is especially liable to increase from ten to twenty years of age, because at this time the sclera is more pliable and the child is using the eyes more.

COMPLICATIONS.—As a result of posterior staphyloma, we frequently find opacities of the vitreous and pigmentation of the retina from the traction upon it.

The majority of cases of detachment of the retina are dependent upon the posterior staphyloma. Posterior polar cataract is also apt to result from disturbances of nutrition.

PROGNOSIS.—The prognosis should always be guarded, especially if the patient is obliged to use the eyes.

TREATMENT.—As myopia always accompanies this disorder of the fundus, the proper selection of glasses should receive our first attention, the greatest care being taken that they are not too strong.

We should next warn the patient against the overuse of the eyes for near objects, and also to always avoid stooping or bending forward when using the eyes at near work, as this tends to increase the venous congestion, thus serving to accelerate the progress of the disease. It is injurious to read in the recumbent position. These patients should, therefore, sit upright, with head erect, when reading, and with the back to the light, so that the page will be illuminated and the eyes not subjected to its bright glare. The work or book should not be brought nearer as the eye becomes fatigued, but be laid aside until the eyes are thoroughly rested. If the patient complains of dazzling from the bright light, as is often the case, either blue or smoked glasses may be allowed. In aggravated cases they should be required to abstain from all near work. An effort should also be made to overcome the insufficiency of the internal recti by exercising with prisms as described under exophoria, as by increasing the power of convergence we remove somewhat the strain upon the accommodation.

The constant and continued use of *Atropine* for a long time has been found advantageous in some instances.

**Belladonna.**—Sclero-choroiditis posterior, with *flushed face and throbbing congestive headaches*. The eye appears hyperæmic externally as well as internally. *The optic nerve and whole fundus are seen congested*. Opacities may be present in the vitreous; photopsies and chromopsies are sometimes observed. The eyes *quite sensitive to light*.

**Duboisia.**—Vessels of the optic disc and retina much enlarged and tortuous. Disc congested and outlines indistinct. Sharp pain in the upper part of the eyeball.

**Phosphorus.**—Fundus hyperæmic. *Muscae volitantes* and flashes of light before the vision. Everything looks red.

**Prunus spin.**—Staphyloma posterior, accompanied by *pains in ball, as if pressed asunder, or sharp and shooting in and around the eye*. Vitreous hazy and vessels of the fundus injected.

**Spigelia.**—When accompanied by *sharp stabbing pains* through the eye and around it, often commencing at one point and then seeming to radiate in every direction.

**Thuja.**—An important remedy in all *inflammatory conditions of the sclera*, especially in *strumous or syphilitic subjects*. The globe

may be quite sensitive to touch and the photophobia is usually marked.

Carbo veg., Croc., Jaborandi., Lyco., Kali iod., Merc., Physos., Ruta and Sulph. are also remedies to be borne in mind. Compare remedies for Choroiditis.

**Senile Changes of the Choroid.**—A rare form of colloid degeneration is sometimes met with in old people. There arises at the periphery from the lamina elastica, small, yellowish-white nodules which press forward into the retina, pushing aside the pigment layer. These nodules are irregularly scattered through the periphery and may be irregularly surrounded by pigment. They gradually extend toward the posterior pole of the eye. They resemble somewhat the spots of disseminate choroiditis, and are practically of little importance, as the vision is but very slightly, if any, disturbed.

Another form described by Berry (*loc. cit.*) as *senile central choroiditis* shows in the early stages a reddish-yellow, irregularly-oval shaped patch which later assumes more of an atrophic appearance, the edges become more irregular and bordered by pigment. The patch generally appears in both eyes and varies in size. The condition causes metamorphopsia and a central scotoma, so that central vision is very greatly impaired. There is no tendency for the condition to extend to other parts of the fundus and hence vision is never entirely destroyed.

**Albinism.**—General absence of pigment in the tissues is a congenital defect which may affect the entire uveal tract, and, when it does, the iris is of a very pale blue, the pupil is small and there is a constant effort to avoid the light. Nystagmus is usually present, the lens may be ill-developed and there is always amblyopia. A pinkish glare is seen from the pupil, and with the ophthalmoscope the choroidal vessels are brilliantly outlined. Albinos always bring objects very close to the eyes to compensate for their amblyopia and to abate the nystagmus by strong convergence. Slight relief is obtained by the use of dark glasses to moderate the light.

**Tumors of the Choroid.**—*Tuberculosis of the choroid* occurs in the disseminated form or as a single nodule. The *miliary* form



appears as small, round, elevated spots of a whitish or pale yellow color, which may within a few days grow larger and increase in number. Sometimes twenty or thirty may be counted in the eye. Both eyes may be involved, and they are especially found around the optic nerve. Pathologically they are the same as miliary tubercles elsewhere. With the addition that the giant cells contain pigment. The choroid between the nodules is hyperæmic and infiltrated with round cells. Their presence forms one of the symptoms of general miliary tuberculosis, especially when the meninges are affected.

*Solitary tubercle* of the choroid appears as a rather large light-colored tumor which causes detachment of the retina and blindness. They are found to consist of a great number of smaller miliary nodules that have coalesced. Their occurrence in young people and the discovery of other foci of tuberculosis are the diagnostic signs between the solitary tubercle and sarcoma of the choroid. As the eye is always lost and life endangered the prognosis is unfavorable. The treatment is enucleation.

*Sarcoma*.—Nearly all varieties of sarcoma may be found occurring in the choroid, although the pigmented or melano-sarcoma are by far the most frequent. Sarcomas usually commence at either the ciliary region or around the posterior pole of the eye. When located anteriorly the iris is apt to be bulged forward and upon dilatation of the pupil a greyish-brown or black mass may be seen and a scotoma is present. If in the macular region there is in the early stage loss in visual acuity and the ophthalmoscope shows a detachment of the retina of a nodular form and abrupt sides. The diagnosis of a tumor behind the detachment may present some difficulties. If a tumor is present, the color appears darker than in a simple detachment and the tension is increased; while, in simple detachment, the tension is diminished, the detached part of the retina has a wavy appearance on movement of the eye, generally occurs at the posterior pole of the eye and usually settles to the bottom. Glaucomatous symptoms in a detachment of the retina generally indicate the presence of a tumor. The origin of the growth in some cases may be traced to an injury of the eye, although more often it is a primary condition with no traceable cause. Knapp\* divides the symptoms and

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\* A Treatise on Intra-ocular Tumors.

progress of choroidal sarcoma into four stages: First, the origin and commencing growth without symptoms of pain or irritation of the eye, the only subjective symptom being a disturbance of vision. The first stage varies from six months to four years. Second, the appearance of inflammatory symptoms in the eyeball. The most characteristic symptom of this stage is the severe pain due to the increased tension. In this second, or glaucomatous stage, blindness rapidly comes on and the diagnosis is now often impossible. This stage usually lasts about one year. Third, the stage of perforation, when the external appearance of the growth, if it breaks anteriorly, is that of dark, hard nodules. If the perforation occurs at the posterior pole we soon get an exophthalmos and restricted movement of the eye. There is at first relief of pain, but as the progress is now rapid pain returns, hæmorrhage and an abundant secretion sets in and there is simply a mass of tumor and death is apt to occur from exhaustion. The fourth and last stage is that of metastasis to other organs, usually the liver or lungs, with the inevitable death of the patient. Sarcomas occurring at the posterior pole of the eye, while rare, have been found, and Griffith\* reports a case seen by himself and gives the records of six other cases. Sarcoma appears especially in old age, is very rarely seen under forty, and rarely affects but one eye. The prognosis is fatal if left alone and is unfavorable even in the early stage. There is but little danger of recurrence in the orbit after enucleation in the first stage, but Fuchs says the danger of metastasis is not essentially influenced by the time at which the operation is performed. The pigmented variety is more malignant and more liable to return, especially when it has reached the glaucomatous stage prior to removal. About two-thirds of all sarcomas return after removal. Microscopical examination may show the tumor to be any one of the following varieties: Melano-sarcoma, leuco-sarcoma, fibro-sarcoma, myo-sarcoma, chondro-sarcoma, osteo-sarcoma, cysto-sarcoma, glio-sarcoma, or sarcoma-cavernosum. The *treatment* should always be an early enucleation and care should be taken to sever the optic nerve as far back as possible. In the third stage the orbit must be thoroughly cleaned out.

**Ossification of the Choroid.**—True bone may, in the course

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\* Archiv. Ophthalm., vol. xvii., 2, 1888.

of time, be formed in the choroid. It is usually found in the inner layers of atrophied balls and more especially in eyes that have been lost by irido-choroiditis. The plate of bone generally assumes a more or less spherical shape, although some spiculæ or growths may be found upon it. The diagnosis is made by feeling a hard body which ends at the ciliary region, as ossification never takes place in the ciliary body. The principal danger seems to be that of exciting sympathetic irritation and the treatment should be enucleation.

**Hæmorrhages in the Choroid** are the result of some diseased condition of the blood-vessels. The exciting cause may be from injuries, operations, coughing, etc. The hæmorrhage may be slight or extensive and it may extend forward between the choroid and retina, producing detachment of the retina, or more frequently it will extend outward between the choroid and sclera and may cause a separation of the choroid from the sclera. The diagnosis between hæmorrhage in the choroid and hæmorrhage in the retina is uncertain, when occurring in the outer layers of the retina; but when in the inner, or nerve-fibre layer of the retina, the hæmorrhage has a striated or flame-shaped appearance, while that in the outer layer of the retina or in the choroid is not striated. Hæmorrhage into the retina usually corresponds to the retinal vessels—that is, it usually occurs along the course of the vessels and is apt to cover the vessels slightly. If there are no retinal vessels near the hæmorrhage, it is more likely to be in the choroid. If the hæmorrhage is in the retina, its color is more of a bright red and its outlines are well defined; while if in the choroid it appears of a darker red and the outlines are ill-defined. Choroidal hæmorrhages interfere somewhat with the vision by causing scotoma. On absorption of a hæmorrhage there is left behind an atrophic spot surrounded by pigment.

**TREATMENT.**—Hæmorrhage is the most common symptom that demands our attention in the treatment of a rupture of the choroid, though we may have hæmorrhages arising spontaneously or from inflammatory changes, etc.

The remedies chiefly called for will be *Arn.*, *Bell.*, *China*, *Crotal.*, *Ham.*, *Lach.*, *Merc. corr.*, or *Phosph.*

For special indications refer to *Retinitis Hæmorrhagica*.

If there is hyperæmia or inflammation of the choroid present, our treatment will be guided by the rules laid down under choroiditis.

**Detachment of the Choroid** from the sclera may occur from an injury, from an effusion of blood or serum, or from a tumor. Its diagnosis is always difficult and uncertain. The ophthalmoscopic examination gives an appearance similar to that of a tumor—a dark mass, like that seen in sarcoma, but more often at the lower part of the eyeball. In detachment the tension is decreased, while in tumor of the choroid it is increased. Groenouw\* reports two cases of detachment of the choroid, after cataract extraction, with spontaneous recovery. As these simulate choroidal tumor, he cautions against enucleation until after watching the case for two weeks at least, as the apparent tumor may disappear spontaneously. Eyes have been enucleated for choroidal tumor which have proven to have been a detachment of the choroid. The tension is, however, diminished and it differs from retinal detachment by having none of the wavy appearance on moving the eye, and it has a dark red or black appearance instead of the bluish-green color of a detached retina.

**Rupture of the Choroid.**—This condition is of comparatively frequent occurrence. It is usually found after a blow on the eye, and we may find associated with it, from the same injury, a rupture of the retina, a separation of the iris, or a dislocation of the lens, but often the rupture of the choroid occurs alone. It is generally accompanied by a hæmorrhage that often conceals the rupture at first. The location of the rupture is almost always at the posterior pole of the eye, and is more frequently seen between the optic nerve and the macula. Rupture occurs at this point, because the choroid is here more closely attached to the sclera and does not so easily give to the impact of the blow. It is generally vertical and in the shape of a curved line, the concavity being directed toward the optic nerve; it is most frequently a single line, with occasionally one or more bifurcations, although two distinct ruptures may occur.

The ophthalmoscopic appearances vary. In the early stage it

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\* Archiv. Ophthalm., vol. xviii., 3, 1889.



may be completely obscured by the hæmorrhage. Later it is seen as a yellowish-red line, and, as the blood becomes absorbed and the swelling and haziness of the retina pass off, it gradually assumes a more and more white appearance, until it finally looks like a clear white line, possibly bordered by a little pigment. The pigment layer of the retina is always ruptured, and usually the layer of rods and cones is also involved. The loss of vision depends upon the amount of destruction in the retina and its nearness to the macula. It causes a scotoma, more or less large, according to the size of the rupture.

PROGNOSIS.—Should be guarded, because, in the atrophic stage, the vision may decrease after it has first improved. When the retina is involved we never find the retinal vessels passing over the ruptured choroid as they may in an uncomplicated case.

**Coloboma of the Choroid.**—This is a congenital anomaly, often hereditary, due to an arrest of development in foetal life and is usually associated with a coloboma of the iris, but may be found alone and may be present in one or both eyes. Other evidences of arrested development, such as harelip and cleft palate, are sometimes met with, together with the ocular defect. The usual location of a coloboma of the choroid is downward or downward and inward, and may extend from the iris through the ciliary body and choroid to the optic nerve, which may also be involved. Coloboma may vary greatly in shape in different cases. It is, however, generally more pointed or narrow at the optic nerve, becoming wider toward the equator. The appearance with the ophthalmoscope is that of a white, glistening patch, with the retinal vessels seen coursing over it and occasionally masses of pigment may be found here and there upon it; the edges of the coloboma appear distinct, clear cut and often pigmented. In all cases the retina is either imperfectly developed or absent, and, in consequence, a scotoma corresponding to the coloboma is usually present. The sclera may also be to some extent affected; that is, it is thinned and may be staphylomatous. In place of the choroid over the region of the coloboma there is to be found a thin connective tissue membrane which corresponds to both the choroid and retina, as the vessels of both are found in it. Cases of so-called coloboma, in which the defect is confined to the region of the

macula alone, have been rarely reported, but these may possibly have been the result of degenerative changes following some inflammatory condition in intra-uterine life. Johnson\* gives a thorough description of extra papillary colobomata, illustrated by drawings and chromo-lithographs. He believes that coloboma may occur in any part of the fundus and are more frequent than generally diagnosed. They differ from atrophic changes due to disease in that their margins are always sharply defined, they are always surrounded by healthy tissue, the pigment is in front and never behind the retinal vessels, the appearance of the coloboma always remains the same, the floor of the coloboma being of a dazzling whiteness, or sometimes covered by a layer of connective tissue looking like mother-of-pearl.

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\* Archiv. Ophthal., vol. xix., 1, 1890.

## CHAPTER XVIII.

## Diseases of the Retina.

**Anatomy.**—The retina is the delicate membrane lying between the choroid and the vitreous and extending from the optic nerve to the ciliary processes, where it terminates in a finely indented border called the *ora serrata*. Microscopically the retina is divided into ten layers which are, from within outward: 1. The internal limiting membrane; 2. The nerve-fibre layer; 3. The layer of ganglion cells; 4. The internal molecular layer; 5. The internal granular layer; 6. The external molecular layer; 7. The external granular layer; 8. The external limiting membrane; 9. The layer of rods and cones; 10. The pigment layer.

The *internal limiting membrane* is a very thin, imperfect membrane, serving to separate the nerve-fibre layer from the vitreous. The fibres of Müller terminate in this layer.

The *nerve-fibre layer* consists of the axis cylinders of the optic nerve-fibres, which run in a radiating direction to the ora serrata, where they terminate. At the macula lutea these fibres are bent into arches and are so arranged that a larger number of them reach the yellow spot than could if they approached it in a radiating direction.

The *layer of ganglion cells* forms, excepting in the region of the macula, several layers of multipolar cells, having both a nucleus and a nucleolus. A nerve-fibre enters each of these cells and one or more prolongations extend outward into the inner molecular layer. These ganglionic cells are arranged more closely to each other near the optic nerve than at the ora serrata.

The *internal molecular layer* consists of the fine fibres from the layer of ganglion cells, irregularly arranged, with an amorphous molecular substance.

The *internal granular layer* is composed of two kinds of cells with nuclei. The larger of these are nerve cells, similar to those in

the layer of ganglion cells, and having two offshoots, one passing into the inner granular layer to anastomose with the offshoots from the ganglionic cells and the other passing outward into the external molecular layer, where, it is claimed by some, they anastomose with fibres from the layer of rods and cones. The smaller

FIG. 76.

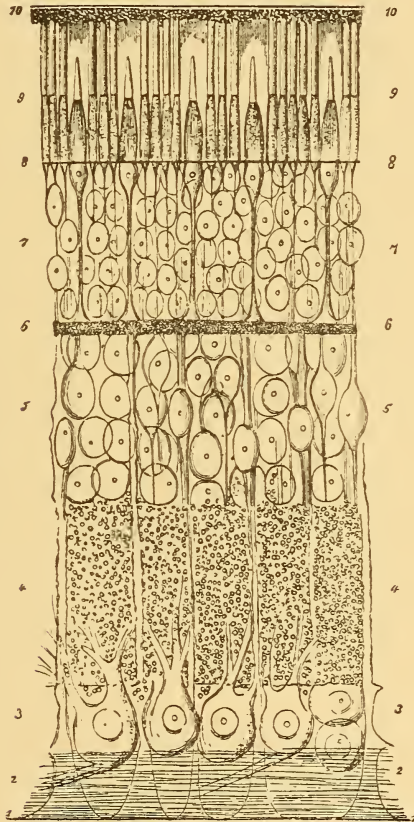


Diagram showing minute anatomical structure of retina.

cells of this layer are connected with the fibres of Müller.

The *external molecular layer* is very thin and is made up of the



fibres just mentioned, together with a molecular substance similar to that of the internal molecular layer.

The *external granular layer*, like the internal, is composed of both nerve and connective tissue elements. The former consists of bi-polar cells, from which offshoots pass outward to the layer of rods and cones and inward to the internal granular layer.

The *external limiting membrane* is the expansion formed by the terminal extremities of the fibres of Müller.

The *layer of rods and cones* is the most important part of the retina. The rods, commencing as fine fibres in the outer molecular layer, pass through the outer granular layer and, just beneath the external limiting membrane, begin to increase in size, forming the rod granule, and some distance after passing through this membrane they taper down into cylindrical shaped rods, which extend outward to the pigment layer. The cones also commence as a cone-shaped swelling in the outer molecular layer, where they are in direct communication with the fibres from the internal granular layer. The cone-fibre becomes thinner until, just underneath the external limiting membrane, it again swells rapidly and there forms the cone itself, which contains a large oval nucleus and nucleolus. The cones are shorter and thicker than the rods and are of a bottle-shaped appearance. The rods and cones are arranged perpendicularly to the plane of the retina and may be divided into an inner and outer part. The inner segment is thicker than the outer and appears granulated; the outer part is broken up into fine, highly refracting lamellæ, appearing like superposed circular discs or a pile of coins.

The *pigment layer* consists of a single layer of hexagonal nucleated cells, the inner surface of which is loaded with pigment granules.

The *fibres of Müller* form the connective tissue framework of the retina which traverses its various layers from the internal to the external limiting membranes and spreads out in these membranes.

The *macula lutea* or *yellow spot* is about 1.25 mm. in diameter and is the most sensitive portion of the whole retina. It lies to the outer side of the antero-posterior axis of the eyeball. The shape of the macula has been almost universally described in textbooks as oval; the error of this has been pointed out by Johnson\*,

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\* Archiv. Ophthalm., vol. xxi., 1, 1892.

who claims that: "The macula is invariably circular, and probably corresponds to the extreme limit of the macula region," and that it is best seen with a very weak illumination and by the direct method; that by this method of examination the macula ring can be seen in its entire circumference in nearly every person under thirty-five years of age and frequently over that age. He concludes that the mistake of all authors who have seen the macula as oval is that they have examined by the indirect method. The color of the macula has also been variously described, usually as of a somewhat yellowish appearance, from which it was called the yellow spot, but Johnson (*loc. cit*), by means of sixteen colored drawings, shows that "in normal eyes of Europeans the inner portion of the macula appears of a more intense or brighter red than the fundus generally, the color deepening as it approaches the fovea centralis, where it is almost always masked by the bright foveal reflex, varying in shape and intensity."

Anatomically the macula differs from other parts of the retina in that there are no rods, and the cones are longer and narrower than in other parts of the fundus. At the centre all the other layers of the retina are thinner, forming a depression called the fovea centralis, but toward the margin the retinal layers, especially the layer of ganglionic cells, are for the most part thicker than elsewhere.

The *vascular supply of the retina* is derived from the arteria centralis retinæ which divides on the optic disc into an upper and lower branch. These branches then turn outward, forming a large ellipse around the macular region, none of its capillaries extending into the fovea; other branches are given off to supply the inner and other parts of the retina. Each artery is generally accompanied by a vein.

The appearance of the healthy retina is that of perfect transparency. The retinal vessels are easily distinguished from those of the choroid by being more clear and well-defined and by their taking a more radiating course and branching dichotomously. Pulsation of the retinal veins and still more rarely of the arteries may occasionally be seen in normal eyes; both may be produced by pressure of the finger upon the globe during an ophthalmoscopic examination. Usually, however, pulsation of the retinal vessels is indicative of some pathological change.

**Hyperæmia Retinæ.**—It is always difficult to state in any given case whether the congestion exceeds that which is physiological or not, and in making the diagnosis the relative sizes of the arteries and veins should be considered. Normally the retinal arteries are about three-quarters the size of the corresponding vein. Hyperæmia may be either active or passive. *Active hyperæmia (arterial or irritation)* usually results from some straining of the eyes, such as a prolonged use of the eyes at fine work or by poor light. It is very often associated with or caused by some refractive error and is, of course, present in the first stage of retinitis, or may be present with inflammation of the cornea, iris, etc. The relative size of the vessels in active hyperæmia is usually well maintained and the diagnosis rests upon the congestion of the optic disc, which becomes more pinkish, with less contrast between it and the surrounding fundus. It manifests itself to the patient by fatigue on using the eyes, sensitiveness to light, pain and pressure within the eye. *Passive hyperæmia (venous or stasis)* results from some circulatory interference which may take place in the eye, as in glaucoma, or external to the eye, as in pressure upon the optic nerve. In this form the relative normal proportions between the arteries and veins becomes lost and we find the veins tortuous and increased in size, while the arteries may either remain normal or become diminished. In hyperæmia the only symptoms complained of by the patient will be some dimness of vision; or of flashes of light before the eyes.

**TREATMENT.**—Hyperæmia frequently depends upon some refractive error, which should be corrected by suitable glasses. Rest of the eyes is of great importance, and hence the patient should be instructed to abstain from all use of the eyes. The remedies most frequently found of service are *Dubois.*, *Bell.*, *Phos.*, *Conium*, *Puls.* or *Bry.* The special indications will be found under *Retinitis*.

**Retinitis Simplex.** — (*Retinitis Serosa, Retinitis Diffusa, Oedema of the Retina.*)

**PATHOLOGY.**—There is a hyperæmia of the retinal vessels followed by an infiltration of serous fluid into all the layers of the retina. The membrane, especially in the neighborhood of the disc, becomes somewhat swollen and thickened.

**SYMPTOMS.**—Patients will complain of a diminution of vision, as though looking through a mist, and the field of vision may be somewhat impaired. The ophthalmoscope will show a hyperæmia of the retina and optic papilla, together with a diffuse grayish or bluish appearance of the retina, especially in the vicinity of the optic disc, the outlines of which are slightly blurred and indistinct. The vessels may be slightly covered, as with a veil, or appear perfectly distinct.

**CAUSES.**—This form of inflammation may precede or extend into other types of retinitis. It has also been attributed to exposure to cold, heat or strong light, and as a result of over use of the eyes by poor light especially when there is some refractive error, and in many cases it is impossible to assign a distinct cause.

**PROGNOSIS.**—If the disease leads to no more serious form of inflammation, recovery, with perfect restoration of vision, is the rule. Neuro-retinitis is a more common diagnosis, as the optic nerve and retina are usually inflamed at the same time.

**TREATMENT.**—*Rest* is the most important aid in all cases whether inflammatory or only hyperæmic, and the more complete it is, especially in neuritis or retinitis, the better for the patients. They should be instructed to abstain from all use of the eyes, particularly by artificial light. Some authors, Stellwag and others, recommend the confinement of the patient in a darkened room and the employment of a bandage. Such severe measures are, however, not required except in extreme cases. It is better to allow moderate exercise in the open air, taking care that the eyes are properly protected from the irritating influence of bright light by the use of either blue or smoked glasses.

Proper hygienic rules, according to the nature of the case, demand our most careful attention.

**Belladonna.**—One of the most frequently indicated remedies for both hyperæmia and inflammation of the optic nerve and retina. *The retinal vessels will be found enlarged and tortuous*, particularly the veins, while a *blue or bluish-gray film* may seem to overspread the fundus (œdema). *Extravasations of blood* may be numerous or few in number. *The optic disc is swollen* and its outlines ill-defined. The vision is, of course, deteriorated. The pains are usually of an *aching*, dull character, though may be *throbbing* and severe, accompanied by *throbbing, congestive headaches* with visibly



beating carotids and flushed face. Phosphenes of every shape and hue, especially red, may be observed by the patient. Decided *sensitiveness to light*. The eyes feel *worse in the afternoon* and evening, when all the symptoms are aggravated.

**Duboisia.**—Of great value in the treatment of both hyperæmia and inflammation of the optic nerve and retina. *Retinal vessels large and tortuous*, especially the veins. *Optic papilla swollen* and outlines ill-defined (engorged papilla). Hæmorrhages in the retina, aching in the eyes and *pain through the upper part of the eyeball* just beneath the brow, which may be very severe. Chronic hyperæmia of the conjunctiva.

**Phosphorus.**—Hyperæmia or inflammation of the optic nerve and retina, especially with *extravasations of blood*. Degeneration of the coats of the blood-vessels. The eye may be sensitive to light and vision improved in twilight. Vision impaired, muscæ volitantes, photopsies and chromopsies are present, halo around the light. The eyeballs may be sore on motion and pain may extend from eyes to top of head.

**Pulsatilla.**—*Hyperæmia and inflammation of the optic nerve and retina accompanied by more or less severe pains in the head always relieved in the open air*. Sensation as if a veil were before the eyes, or the vision may be nearly lost. All the ophthalmoscopic appearances of engorged papilla or simple hyperæmia may be present; if dependent upon menstrual difficulties or associated with acne of the face or disorders of the stomach.

**Bryonia.**—Serous retinitis or hyperæmia, with a bluish haze before the vision and severe *sharp pain through the eye* and over it. Eyes feel full and *sore on motion* or to touch. Great heat in the head, aggravated by stooping.

**Mercurius.**—Retinitis with marked nocturnal aggravation and *sensitiveness of the eyes to the glare of the fire*. Congested conditions of the fundus found in those who work at a forge or over fires. Degeneration of the blood-vessels, with hæmorrhages into the retina. Concomitant symptoms will assist us in the selection.

**Cactus.**—Retinal congestions, especially if heart trouble is present.

**Conium.**—Fundus congested, with *much photophobia*; ciliary muscle weak.

**Nux vom.**—Retinitis occurring with gastric disturbances,

especially in drunkards. The eye indications vary, but are usually *aggravated* in the morning.

**Veratrum viride.**—*Engorged disc*, with severe pain at menses and general vaso-motor disturbances.

In addition to the above, the following remedies may be of benefit in rare cases or as intercurrents: Acon., Ars., Aurum, Chin. sulph., Gels., Kali. iod., Kali mur., Lach., Spig. and Sulph.

**Dazzling of the Retina.**—Under this heading we shall class all those cases accompanied by a dazzling sensation, due to exposure to the bright glare of the sun, upon snow or water, to the electric light, etc. These conditions may produce a diffuse retinitis or neuro-retinitis, or, again, such exposure may be followed by amblyopia, with no ophthalmoscopic signs. Widmark\* considers the trouble as produced by direct irritation of the part affected and that this is caused almost exclusively by the ultra-violet rays which exert a similar influence upon the skin. The patients complain of a dazzling, a central scotoma and slight impairment of the vision. Objects appear in a mist and the air seems to flicker. Cases of retinitis have also been reported as the result of a single intense flash of light. The treatment of these cases consists in the prevention of all use of the eyes and in protection from the light.

**Retinitis Albuminurica.**—(*Renal Retinitis, Papillo retinitis, Retinitis of Bright's Disease*).

**PATHOLOGY.**—The pathological changes in albuminuric retinitis are numerous and variable in the different stages of the disease. There is at first a slight granular exudation into the retina, with a fatty degeneration of the walls of the vessels. Following this there is a hyperplasia of the connective tissue of the retina with subsequent fatty degeneration. The nerve-fibres become remarkably swollen; these swellings are club-shaped and highly refracting and the whole layer is much thickened. Later these fibres undergo fatty degeneration and atrophy. The ganglion cells may undergo a similar degeneration or remain unaltered. The granular layers become infiltrated and thickened and pass into a fatty degeneration. Hæmorrhages, which result from the degen-

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\* Revue générale d'ophtalmologie, Paris, Aug., 1890.

erated walls of the retinal vessels, may occur at any place, but are found most numerous in the nerve-fibre layer, and serve to increase the destruction of the retinal elements. There may be a slight proliferation of pigment, but this layer is but little affected. There are usually found pathological changes in the choroid, nerve, and other parts of the eye. According to Weeks,\* we may divide this disease into two classes of cases—those occurring in all forms of acute disease of the kidneys, such as pregnancy, scarlet fever, etc., in which the kidney disease precedes the changes in the retina, and, in the other class, he places those dependent upon a general diseased condition of the vessels in which the eye symptoms precede those of the kidney. In the first form, which is by far the most frequent, œdema and white patches appear first, to be followed by hæmorrhages; while in the second class a slight hæmorrhage near the macula and a few bright dots are the first evidence, followed later by the œdema and white patches.

SYMPTOMS.—The only subjective symptoms noticed by the patient is that of impairment of vision, which may vary from a slight cloudiness to complete blindness. The field of vision and also the color vision remains good. Frequently the disease is diagnosed by the ophthalmoscope before the patient is aware that there is any kidney lesion whatever. With the ophthalmoscope there is seen swelling and hyperæmia of the disc; the retinal arteries are somewhat diminished and the veins increased in size; there is a diffuse haziness of the retina, together with hæmorrhage and the formation of white patches.

In a well-marked case there is in the macula or its immediate vicinity numerous fine white spots, which are, in the early stages, small and separate, but later on, or in a truly typical case, form a star-shaped figure, at the centre of which lies the fovea centralis. These specks are due to the infiltration with fat of Müller's fibres. Other of these spots and somewhat larger in size, due to the fatty degeneration of the two granular layers, are usually seen around the papilla, and in this locality they will often coalesce into a broad zone around the optic nerve entrance, giving it the appearance usually designated as surrounded by a snow bank. These peculiar white spots of the retina are due to a fatty degeneration of the nerve-fibre and granular layers, and, when

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\* Archiv. Ophthalm., vol. xvii., 3, 1888.

seen, may be considered almost pathognomonic of albuminuria, particularly so when assuming the star-shaped arrangement at the macula.

The white patches occur mostly in the deeper layers of the retina, as proven by the fact that the retinal vessels may usually be seen passing over them, but may be partially or completely covered by the patch at some places.

Hæmorrhages are almost universally found in albuminuric retinitis, but, unlike the white patches just described, are not especially pathognomonic of this disease. They may occur in great numbers and of various sizes and shapes, from large, dark red extravasations to small, round or linear-shaped spots scattered throughout the fundus. Hæmorrhages occurring in the nerve-fibre layer are striated in appearance. The extent of the hæmorrhages is considered to be somewhat indicative of the severity of the disease.

COURSE.—When due to pregnancy, diphtheria, or scarlet fever, is comparatively short, but when dependent upon the contracted kidney it is very chronic. Albuminuric retinitis may either gradually or suddenly pass into a neuro-retinitis resembling very closely the choked disc from cerebral causes. The ophthalmoscope picture of retinitis albuminurica (See Chromo-Lithograph, Plate II, Fig. 6) may remain unaltered for a long time, the hæmorrhages and white patches slowly disappearing, while new ones at the same time may make their appearance. The white plaques at the macula are always the last to disappear, and, may never, according to some authorities. As the secondary changes go on the optic disc becomes discolored and atrophied, the retinal vessels become contracted and pigment changes in the retina result.

CAUSES.—Renal retinitis may occur with any form of kidney disease, but is especially found with the contracted kidney. It is also quite frequently seen associated with the albuminuria of pregnancy, and more rarely with post scarlatinal nephritis. A few cases have also been reported associated with functional albuminuria. Both eyes are as a rule involved, although it may occur in but one.

DIAGNOSIS.—The ophthalmoscopic appearances are always quite characteristic of this disease, and the presence of albumin in the



urine would at once confirm the diagnosis. Diabetic and leukæmic retinitis both present appearances of the fundus very similar to those found in this disease, and an examination of the urine will be necessary to clear up the diagnosis. A neuro-retinitis resulting from intra-cranial disease, especially if it be complicated by albuminuria, would present great difficulty in the differential diagnosis and a very careful study of the general symptoms would be required. The white spots in choroidal affections would differ from this by the presence of more or less pigment and by the different location and shape of the white patches. Opaque optic nerve-fibres resemble somewhat closely the snow-bank appearance around the papilla, but in opaque nerve-fibres the white patches extend out from the disc in a fan-shaped manner, it is unaccompanied by any change in the macula or œdema of the retina and the vision is but little or none affected.

PROGNOSIS.—In albuminuric retinitis the prognosis must necessarily cover two points; first, as to vision, and second, as to the life of the patient. The prognosis as to vision should always be unfavorable, excepting in the slighter cases and particularly those occurring in pregnancy. The appearance of albuminuric retinitis in all cases, excepting when associated with pregnancy, is always a most unfavorable symptom as regards the life of the patient. It is extremely rare for recovery to take place in cases of kidney disease after the retina has become involved, and in the majority of cases a fatal termination will ensue inside of two years.

In the retinitis albuminurica of pregnancy the prognosis depends chiefly upon the period of gestation, and secondly upon the extent of the disease. Some cases of very extensive hæmorrhages, with marked patches of infiltration of the retina and almost complete loss of vision, when only occurring in the last weeks of pregnancy, may recover, after confinement at full term, with almost complete restoration of vision. On the other hand, slight changes in the earlier months of pregnancy, which have a tendency to increase in spite of treatment, may prove very serious both to vision and the life of the patient as well, if allowed to go on to full term. The longer the disease exists the greater are the degenerative changes which may take place, and it is on this account that the appearance of the disease in the last weeks of pregnancy proves far less serious than when occurring early. Induction of prema-

ture delivery in these cases becomes then a question of grave importance. The presence of albuminuric retinitis, when of a high degree and accompanied by loss of sight, denoting advanced degeneration of the kidneys, together with the fact that the uræmic condition of the blood, threatens the life of both mother and fœtus, to us argues in favor of interference. Howe draws the conclusion that "The induction of labor is warrantable when the retinitis appears in the early stage of pregnancy and persists in spite of proper treatment, but is not warrantable in the last few weeks, in spite of the greater ease with which it is accomplished, unless the inflammation is unusually severe."

**COMPLICATIONS.**—Detachment of the retina and hæmorrhage into the vitreous are the most frequently seen complications, although other conditions, such as glaucoma, extravasations into the choroid and embolism have been recorded as occurring with this disease.

**TREATMENT.**—The principal treatment should be directed to the kidneys, the seat of the primary disease, and such hygienic and dietetic measures adopted as are recommended for Bright's disease. Benefit has sometimes been derived from keeping the patient quiet in bed and upon a low or skim-milk diet. The use of stimulants should be avoided.

**Mercurius corr.**—Has been more extensively used in *albuminuric retinitis* than any other remedy. The fatty degeneration, extravasation of blood from the weakened vessels and all the pathological changes in the eye as well as in the kidney point to Mercury as the remedy, even though no characteristic subjective symptoms are present. The results are especially favorable when pregnancy appears to be the exciting cause of the difficulty.

**Apis.**—If associated with œdematous swelling of the lids and general dropsical condition. Patient very drowsy, with little thirst and scanty urine.

**Arsenicum.**—If the patient is restless, especially at night after midnight, with great thirst for small quantities. Urine scanty and albuminous.

**Gelsemium.**—Retinitis albuminurica occurring during pregnancy. White patches and extravasation of blood in the retina. Dimness of vision appears suddenly. Serous infiltration into the vitreous, making it hazy, may be observed. The patient is thirstless, and albumen is found in the urine.

**Kalmia.**—Nephritic retinitis accompanied by much pain in the back, as if it would break.

Hepar, Kali iod., Plumb. and Phosph. have either been used or are highly recommended for this condition of the eye. In fact, any remedy applicable to the disease of the kidney will often prove of service in the eye complication.

As hæmorrhages are usually found in the retina in this form of inflammation, compare the remedies recommended for *Retinitis Hæmorrhagica*.

**Retinitis Diabetica** (*Retinitis Glycosurica*).—The appearance and general features of this form of retinitis are practically the same as already described under albuminuric retinitis, with the exception that in diabetic retinitis there is, as a rule, less exudation or white patches and usually more hæmorrhages. Opacities in the vitreous, probably due to hæmorrhage, are frequently found. The white spots are apt to be smaller in size and not grouped at the macula or around the disc in the manner so characteristic of albuminuric retinitis, although cases have been reported in which the appearance was absolutely identical. Retinitis occurring with diabetes is quite rare and usually makes its appearance only after the diabetes has existed for a long while. It is more frequently found existing in both eyes, although it may occur in one eye alone. The pathological changes are the same as those occurring in albuminuric retinitis.

As this form of retinitis is especially characterized by hæmorrhages into the retina, compare the remedies recommended for *Retinitis Hæmorrhagica* and *Albuminurica*. In addition to which, *Secale* is suggested, though the chief attention must be directed to the diabetes.

**Retinitis Leukæmica** (*Splenic Retinitis*).—This is an extremely rare form of retinal inflammation, which, in its earlier stages, resembles a simple retinitis, but later it develops a characteristic appearance, the essential features of which are the peculiar color of the fundus and of the blood in the retinal vessels. The fundus becomes of a peculiar orange hue, due to an alteration in the elements of the blood of the choroidal vessels, and presumably the same changes in the blood exists in all the vessels of the body.

Loring\* says this orange tint is by no means constant and that he has more frequently seen the color as a pale grayish-pink, and in some cases there is no deviation from the normal color of the fundus. The retinal veins are of a bluish-pink, while the arteries have the same orange color; the veins are enormously distended; the arteries are less distended, so that the normal proportionate relation between the vessels seems exaggerated. The optic disc may be somewhat paler than normal, and its outlines slightly ill-defined. Hæmorrhages are especially prone to occur in this disease, and are generally found in the anterior half of the retina. These hæmorrhages may disappear rapidly and fresh ones appear in different parts of the fundus. The diagnosis should depend upon a microscopical examination of the blood, which shows a decreased proportion of red blood-corpuscles and an increased proportion of white. The treatment should of course be directed to the general disease, as the retinal complication may be looked upon as merely a symptom of the disease.

**Retinitis Hæmorrhagica** (*Hæmorrhages into the Retina, Retinitis Apoplectica*).—Under this heading we class all hæmorrhages into the retina, whether accompanied by inflammation or not, excepting those occurring in the characteristic or distinct forms of retinitis elsewhere described. Hæmorrhage into the retina is common to nearly all forms of retinal inflammation and perhaps should be considered a symptom rather than a disease, but they are certainly met with in cases independent of local inflammatory changes. When unaccompanied by inflammation, hæmorrhages may occur in any layer of the retina, and may extend into the vitreous or backward, causing detachment of the retina. They are especially apt to occur along the course of some of the larger vessels, and the macular region seems to be a favorite site. The immediate cause of the hæmorrhage seems to be usually the result of a disease of the walls of the vessels, allowing of diapedesis, rather than from rupture, although rupture no doubt does occur in many cases, especially when following traumatism or after operations.

The location of the hæmorrhage, as to the layers of the retina

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\* Text-Book of Ophthalmoscopy, Part II., p. 154.



involved, can usually be determined by the appearance of the extravasation (See Chromo-Lithograph, Plate III., Fig. 1.) If occurring in the nerve-fibre layer, as is more often the case, because it is in this layer that the larger retinal vessels course, the hæmorrhage assumes a flame-like appearance, elongated and sharply defined borders, with radiating extremities. This peculiar shape of the extravasation is due to the direction of the nerve-fibres between which the blood settles. If occurring deeper in the retina, the hæmorrhage is more irregular or circular in shape, although this appearance may be seen in an extensive hæmorrhage in the nerve-fibre layer by causing a rupture or pushing aside of the nerve-fibres.

**SYMPTOMS.**—The subjective symptoms of retinal hæmorrhages, when unaccompanied by inflammation, are, when in the posterior pole, a positive scotoma, together with sometimes a colored vision; that is, in some rare cases the patient will complain of a reddish mist before the eyes after a fresh hæmorrhage. If the hæmorrhage has occurred at the periphery, there will be found a defect in the field of vision corresponding to the extravasation. Metamorphopsia or distortion of objects seen by the portion of the retina affected may also be present. If signs of inflammation are added to hæmorrhages in the retina, we will then have a swollen appearance of the disc, its outlines are clouded and indistinct, the retina is hazy, its veins engorged and tortuous and the arteries are small. When the signs of retinitis are present, they may be secondary and due to the irritation caused by the blood clots, which may lead to fatty degeneration, to hypertrophy of the nerve-fibres, and, rarely, to attacks of acute glaucoma.

In the so-called *Retinitis Apoplectica*, the fundus is spattered with small hæmorrhages, with here and there larger, irregular patches of blood. These hæmorrhages are usually along the side of the vessels, and many of the smaller ones appear as short lines running parallel to the vessels. This form of retinitis always comes on suddenly and chiefly among elderly people. The vessels are affected with atheroma or syphilitic degeneration, and cardiac or chronic renal disease are usually present. The occurrence of apoplexy of the retina is always indicative of serious cerebral hæmorrhage.

**CAUSES.**—Hæmorrhage into the retina may occur from numer-

ous causes; in the majority of cases it is due to arterio-sclerosis or some heart disease, especially if but on one side; from disturbances in the circulation we find it frequently in cardiac lesions, such as hypertrophy or valvular stenosis, in embolism or thrombosis of the central vessels of the retina and in menstrual disturbances. It may also be caused by general conditions or diseases resulting in changes in the composition of the blood or in the walls of the vessels, as found in septicæmia or pyæmia; in diseases of the kidney, spleen or liver; in pernicious anæmia, hæmophilia, purpura and scurvy; in jaundice, diabetes, gout, etc. It also often results from traumatism and from sudden reduction of the intra-ocular tension, as in iridectomy for glaucoma. Many other causes have been assigned in reports of individual cases of retinal hæmorrhage. Lang\* records a hæmorrhage at the macula of three times the diameter of the disc in size, occurring after an action of the bowels in a healthy boy, twenty years of age, subject to constipation. Four months later the hæmorrhage had disappeared and vision was perfect.

PROGNOSIS.—This depends upon the cause, together with the size and location of the hæmorrhage. Many cases recover with partial or complete restoration of vision when occurring in young, robust individuals and when not the result of some organic lesion elsewhere. As a rule, however, the prognosis is unfavorable, not only so far as the ocular condition is concerned, but to life as well, for, as we have seen, retinal hæmorrhage is frequently the forerunner of cerebral extravasation, or occurs merely as a symptom of some serious disease of other organs.

COMPLICATIONS.—Secondary changes in the retina and optic nerve frequently follow. Glaucoma, either acute or hæmorrhagic, detachment of the retina and vitreous opacities, not infrequently result from hæmorrhage into the retina.

TREATMENT.—Rest for the eyes must be enforced. All undue mental or physical exertion and the use of stimulants must be strictly prohibited. Change of scene and quiet and cheerful surroundings, with suspension of business cares or literary labor, are often important. If dependent upon general disturbances, these will require our attention.

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\*Trans. Ophth. Soc. Unit. Kingd., vol. viii., p. 155.

**Lachesis.**—From its use, hæmorrhages into the retina have been seen to speedily disappear and the accompanying inflammation rapidly diminished. It is very commonly called for when no characteristic symptoms are present with the exception of the pathological changes. The retina, and perhaps optic nerve, are inflamed and congested, while throughout the swollen retina may be observed extravasations of blood of various ages and sizes. General indications determine its selection.

**Crotalus.**—In the snake poisons we possess our chief agents for hastening the absorption of extravasations of blood into the retina. *Crotalus* has been used with great advantage, especially if the hæmorrhage is unaccompanied by inflammation.

**Belladonna.**—Apoplexy of the retina, especially when arising from or accompanied by congestive headaches. Suppressed menstruation may be the cause of the difficulty. The retina and optic nerve will be found inflamed and congested.

**Mercurius corr.**—Of great benefit in hæmorrhages into the retina dependent upon pronounced degenerative changes in the coats of the blood-vessels, with or without inflammation. It not only hastens their absorption, but serves to restore tone to the vessels themselves.

**Phosphorus.**—In a hæmorrhagic diathesis when the concomitant indications point to its selection.

**Arnica.**—Retinal hæmorrhages of traumatic origin.

*Duboisia* and *Pulsatilla* may also render valuable service.

**Retinitis Syphilitica.**—Retinitis due to syphilitic infection may be either hereditary or acquired. In the acquired form it generally occurs with the secondary lesions and rarely with the tertiary.

**SYMPTOMS.**—One eye may, at first, be alone affected, though usually the second will become involved later. It is often associated with choroiditis, as already described under choroiditis syphilitica, and may be found associated with an inflammation of the optic nerve, forming a neuro-retinitis. It may be either diffused or circumscribed, usually the former, when it appears as a grayish opacity, especially around the optic disc and extending in lines along the vessels, as white striations in places partly covering the vessels. There may be slight congestion of the disc,

and quite rarely, slight hæmorrhages. The vitreous is especially apt to be involved (*chorio-retinitis*), and we find a diffuse, dust-like opacity, with now and then some thin floating shreds.

Syphilitic retinitis often passes into a chorio-retinitis, when we may have the following appearances, as described by Hirschberg,\* based upon an examination of about three hundred cases: Opacities in the vitreous, usually like a cloud of fine dust, some haziness and congestion of the retina with numerous small white spots throughout the fundus which are free from pigment, sharply outlined, and with no tendency to coalesce. Patients complain of a persistent dazzling and night-blindness, with scotomas and possibly blindness following. Nearly all parts of the eye, cornea, iris, lens and vitreous, may become involved and undergo changes.

COURSE AND PROGNOSIS.—Syphilitic retinitis will often come on quite rapidly, and run an exceedingly chronic course. The prognosis should always be guarded, for, even under the most active treatment and the most favorable general conditions, the improvement may be but slight and relapses are apt to occur. In spite of all treatment it may result in atrophic changes in the retina, choroid or optic nerve.

TREATMENT.—The general indications mentioned under other varieties of retinitis are, of course, applicable in this form of retinal inflammation.

**Mercurius.**—Especially the remedy for this form of inflammation of the retina. The solubis or corrosivus have been more commonly employed, though the other preparations are also useful when special indications point to their use. The retina will be found hazy, congested and often complicated with an inflammatory condition of the choroid or neighboring tissues. The eye is particularly sensitive to artificial light. *Nocturnal aggravation of all the symptoms* is always present. More or less pain is experienced both in and around the eye, especially during the evening and after going to bed.

**Kali iod.**—For syphilitic retinitis this should be one of the first remedies thought of, especially if there is choroidal complication, though the chief indications for its use will be furnished by the general condition of the patient.

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\* Berliner klin. Wochenschr., No. 46, 1888, and Centralbl. f. Augenhk., vol. xii., p. 369.



**Aurum.**—Especially after *over-dosing with iodide of potassium or mercury*, and if accompanied by detachment of the retina. Eye sensitive to touch, with pain in and around, seeming to be deep in the bones. A general syphilitic dyscrasia is perceptible in the constitutional symptoms which govern our selection of Aurum.

**Asafoetida.**—When accompanied by *severe boring, burning pains above the brows*, especially at night; also, if there is pain in the balls from within outward, ameliorated by pressure (reverse of Aurum).

Other anti-syphilitic remedies may be useful, given according to general indications, or we may find a remedy recommended for the other forms of retinitis, serviceable in this variety when particular indications are present.

**Retinitis Punctata Albescens** (*Central Punctate Retinitis*).—This is a circumscribed form of retinitis to which Mooren gave the name of punctata albescens.

Its essential features consist of numerous small white glistening dots and striæ, closely packed together, giving a stippled appearance to that part of the fundus involved. In one case under my observation, a few years ago, the entire fundus was filled with these small white dots, and yet the patient had nearly perfect central vision.

The usual location of this disease is in the posterior pole of the eye in the vicinity of the macula lutea.

In this form of retinitis there is usually but slight if any inflammatory symptoms—merely an increased tortuosity of the retinal veins and possibly a few small hæmorrhages. No especial cause has been assigned for this form of retinitis, which usually occurs in those of middle age. Burnett\* reports one case under his own observation and gives an abstract of five other recorded cases, from which he concludes that the prognosis is, as a rule, good—some cases going on to complete recovery, while none seem to lead to destruction of the vision.

**Retinitis Proliferans.**—A development of connective tissue in the retina may occur at any part of the fundus and appears as a shred-like or membranous formation. These masses are of a

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\* Archiv. Ophthalm., vol. xii., 1, p. 22.

bluish-white appearance and often extend into the vitreous, hiding the optic disc and covering the fundus to quite an extent. They sometimes seem to follow the course of some of the larger vessels, which are in parts covered by the formation and again are seen passing over it. The formation of these patches may have resulted from a previous retinitis or neuritis, although Loring (*loc. cit.*) has seen cases which he believed were either congenital or acquired in very early life. Leber\* attributes the cause of these formations to repeated hæmorrhages, which gradually become organized.

**Retinitis Pigmentosa** (*Sclerosis of the Retina, Pigment Degeneration of the Retina*).—The name retinitis pigmentosa is according to Frost† a misnomer, because the disease is much more of a degenerative change than it is an inflammatory condition.

**PATHOLOGY.**—This consists of a hypertrophy of the connective tissue throughout the retina, with atrophy of the nervous element (especially the layer of rods and cones) and the migration of pigment. There is also a new formation of pigment cells which are very rich in pigment, and at some points an atrophy of the pigment occurs. There is a considerable thickening of the walls of the vessels, with a corresponding diminution in their calibre. The changes commence first in the outer layers of the retina, and later the granular layers are affected, then the layer of rods and cones is destroyed and the entire retina becomes changed and sometimes adherent to the choroid in spots. There is a colloid thickening of the vitreous membrane of the choroid, which extends into the retina and becomes covered with pigment. The disease begins at the periphery of the fundus and gradually extends toward the posterior pole.

**SYMPTOMS.**—Central vision is but slightly affected in the earlier stages of the degeneration, and only becomes materially diminished when the process has involved the region of the macula lutea. The field of vision becomes concentrically contracted, extending as the disease advances until often there is such extreme narrowing of the field that the patient is only able to read by fixing a single word at a time. He may read fine print, yet be

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\* Graefe and Saemisch, vol. v., p. 666.

† Brit. Med. Journ., Dec. 14, 1889.

unable to cross the street alone, owing to the contraction in his field of vision. In extreme cases the contraction progresses to complete blindness. Hemeralopia or night blindness is usually one of the earliest symptoms and often the first to attract the patients' attention—they notice that on approach of dusk their movements become uncertain and that they are apt to stumble over objects.

Ophthalmoscopic examination presents a striking and characteristic appearance. (See Chromo-Lithograph, Plate II., Fig 5.) The entire periphery of the fundus will generally show beautifully arranged masses of pigment, which assume the shape and appearance of bone corpuscles, the processes from which extending off to unite with each other form a network which encircles the periphery of the fundus. The pigmentation will often extend farther toward the macula, on the temporal than on the nasal side and is frequently seen extending farther backward along the course of the vessels. The retinal vessels, both arteries and veins, become greatly contracted. The optic disc becomes of a greyish-yellow appearance, at the same time the vessels are gradually narrowing, owing to the loss of capillary circulation.

COURSE.—This condition, commencing either congenitally or in early childhood, may remain stationary at some period, but usually advances steadily, with increasing contraction of the field, until finally, a little after middle life, vision has become nearly destroyed. Both eyes are almost invariably affected.

CAUSES. It is undoubtedly of hereditary origin in nearly all cases and consanguinity seems to be an important factor, as intermarriage, one or two generations remote, can generally be found. Congenital deaf-mutism, epilepsy and idiocy are frequently seen in cases of retinitis pigmentosa. This disease is more frequently found in men than in women. The prognosis is unfavorable.

DIAGNOSIS.—Retinitis pigmentosa may be confounded with disseminated choroiditis, but in the latter the shape and arrangement of the pigment is decidedly different, the patches are more or less circular, are isolated and present signs of exudation with atrophy, and we find corresponding white patches with irregularly pigmented borders. In retinitis there are no spots of choroidal atrophy, the pigment is stellate and is more apt to be along the vessels or covering them in spots.

COMPLICATIONS.—Nystagmus is frequently present and more especially so in those cases that have become far advanced in very early life. Posterior polar cataract may also be found in the later stages and very rarely vitreous opacities.

TREATMENT.—Over use of the eyes and exposure to bright light must be avoided. Much attention must be given to the general health for a long period. Lyco., Nux vom. and Phos. are suggested as remedies.

**Detachment of the Retina.**—(*Amotio Retinæ, Ablatio Retinæ*).

PATHOLOGY.—In simple or idiopathic cases the fluid behind the detachment is found to be albuminous in character and contains blood and lymph corpuscles, fat cells, pigment, epithelium, etc. The vitreous is usually liquid and the retinal changes consist in a destruction of the rods and cones; fibrous tissue may be formed in the retina and atrophy of the nerve elements ensues. When detachment occurs as a result of morbid conditions of other structures, such as cyclitis and choroiditis, there is, of course, the added pathological changes of those diseases.

SYMPTOMS.—There is more or less loss of vision, which may come on suddenly. This is usually the first symptom to attract the patient's attention to the eyes, although sometimes black spots floating before the eyes, or flashes and rays of light, have been noticed as preceding a detachment. Vision is not wholly lost, unless the region of the macula is involved in the detachment. There is a limitation in the field of vision which appears to the patient as a dark cloud. This restriction in the field often escapes observation in fresh detachments, unless the examination be made carefully and with a weak light, because the retina being nourished by its own vessels still retains its function to a certain extent. When the detachment is due to a tumor, the defect in the field of vision is more sharply defined than when the result of an exudation and the central vision may remain unaffected. If the detachment be of the lower part of the retina, the upper portion of the field of vision is lost, and, if above, the lower, and so on. Patients complain of a distortion of objects (*metamorphopsia*), of black spots floating before the vision—due to opacities of the vitreous—and of various light sensations and phosphenes. Night blindness may or may not be present



The objective appearances with the ophthalmoscope are best seen by an examination by the direct method and there is then noticed, in place of the normal red reflex from the fundus, a green or bluish-gray (See Chromo-Lithograph, Plate III., Fig. 2) membrane which is thrown up into folds and extending forward into the vitreous. The detached retina as a rule is seen to oscillate on movement of the eye and the vessels on the surface of the detached part appear darker and often smaller than normal. Movements of the detached retina are seen when the underlying substance is fluid and the amount of motion depends upon the consistency of the vitreous and is not seen when there is a solid substance, as a tumor, beneath. At the borders of the detachment, which are usually sharply defined from the normal fundus, the retinal vessels pass out of focus and a change of focus is always necessary on passing from a normal to a detached portion of the retina.

The retinal vessels, as they rise over the separated portion, lose their light streak and appear dark and tortuous as they course up and down over the furrows of the detachment. There may often be seen a rupture at some portion of the detached retina. The size and position of these rents vary in different cases. Diminished tension is found in all cases that have existed for some time and when not due to a tumor. The detachment may occur in any part of the fundus, though usually above, and extends gradually to the lower part from a sinking of the fluid, the upper portion of the retina sometimes becoming again re-attached. Detachments may be complete or only partial, and when the latter, may appear as a small line or furrow or may be more or less circular in shape.

**COURSE.**—Detachment often develops within a few hours, but it may gradually take place during one or two weeks. Every detachment has a tendency to extend and become total. Idiopathic detachment is frequently found in both eyes, but rarely occurs in both eyes simultaneously, the second eye being involved often only after many years.

**CAUSES.**—Separation of the retina is most frequently found in myopic eyes, and is more apt to occur in very high degrees of myopia. It seems to occur more frequently in men than in women and in about one-half of the cases in those upward of fifty years of age. It results from traumatism, hæmorrhages, intra-

ocular tumors, cysticerci and from diseased conditions of the eye, such as retinitis, cyclitis, irido-cyclitis, etc.

The mechanism of a detachment has been the subject of extended investigation, and the researches of Leber and Nordenson would indicate that it is due to a shrinking of the anterior portion of the vitreous, which, by dragging upon the retina, causes a rupture and that the fluid of the vitreous passes in behind the retina through the rupture and fills up the space left by the membrane. The diffusion theory supported by Ræhlmann\* is that, owing to some chemical change in the vitreous, the diffusing "vitreous salts" cause an albuminous fluid to collect behind the retina, this diffusion of fluid behind the retina going on it is pushed more and more inward until it finally gives away. The primary cause, therefore, seems to be due to some change in the vitreous which may perhaps be due to some senile change or to some disease of the choroid or ciliary body whereby the nutrition of the vitreous has become altered.

DIAGNOSIS.—In the majority of cases the ophthalmoscopic appearances present such a perfect picture that no trouble is found in recognizing a detachment. The only difficulty occurs in small or transparent detachments, and these will usually be revealed by a careful examination with the aid of a mydriatic. The most important point in the diagnosis is to determine whether it is due to an intra-ocular tumor, and the most valuable sign rests on the tension, which is plus in tumor and minus in simple detachment.

PROGNOSIS.—This, as a rule, is unfavorable, for the detachment, when of any size, will usually extend and become total, no matter what care or treatment is followed. A detachment of the upper part of the fundus will usually extend to the lower, from a sinking of the sub-retinal fluid. Cataract frequently occurs in cases of detached retina. Spontaneous re-attachment may take place after a longer or shorter interval, and, when it occurs early, the vision may be greatly restored and no ophthalmoscopic signs be seen that any detachment has taken place.

TREATMENT.—If the patient comes under treatment a short time after the detachment has occurred, or even in six months afterward, he should be confined to his bed for from four to six weeks at least, chiefly upon his back, with the eyes bandaged.

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\*Archiv. für Ophthal., xxvii, Part I, p. 1.

This is of great importance in aiding recovery. If it is impossible to confine the patient to his room, he must be warned to avoid all use of the eyes and to keep as quiet as possible. If he must be out in the light the eyes should be protected by darkly colored glasses. In many cases, the constant use of Atropine is of advantage, as it prevents accommodation and thus keeps the eye and tissue more quiet.

Operations to allow the escape of the fluids have been reported with some success. Sutphen\* reports three cases of detachment of the retina treated by puncture, with one success and two failures. Bull† reports five cases treated by Schoeller's method of injecting tincture of iodine into the vitreous in front of the detached retina to tear the shrinking or contracting bands in the vitreous and to produce an adhesive retinitis. In all of these cases the results were unfavorable. Yet successes have been reported by the authors of both these methods.

**Gelsemium.**—One of the most prominent remedies for *serous infiltration beneath the retina* dependent upon injury, or myopia. Especially indicated if accompanied by choroiditis, with haziness of the vitreous and some pain. A bluish haze, or wavering is often observed.

**Aurum.**—Has been used successfully in *amotio retinæ*. The symptom under Aurum which suggests its use is as follows: "Upper half of vision as if covered by a black body; lower half visible." The choroid, or retina, is usually inflamed, and opacities are seen in the vitreous, giving rise to the "blacks" complained of by the patient.

**Apis.**—Fluid beneath the retina. Passive pain in the lower part of the ball, with flushed face and head. Stinging pains through the eye. Oedematous swelling of the lids.

**Arnica.**—*Traumatic detachment of the retina.*

**Digitalis.**—Adapted to the general pathological condition and has this common symptom of detachment of the retina: "As if the upper half of the vision were covered by a dark cloud evenings on walking." Benefit has been seen from its use.

Ars., Bry., Hep., Kali iod., Merc and *Rhus* may also be thought of for this condition.

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\*Trans. Amer. Ophthal. Soc., 1888.

†Trans. Amer. Ophthal. Soc., 1891.

**Ischæmia Retinæ** (*Anæmia of the Retina*).—This term has been applied to a peculiar condition of the retinal circulation which has been seen or recorded a few times.

It consists in a great reduction in the size of the retinal vessels, especially the arteries, which appear as very fine threads, and in one case recorded by Knapp\* could not be found at all in one eye. This was a case of sudden blindness during whooping cough, the optic nerves were white and the vessels were all very fine and thread-like, while no arteries could be discerned in the right eye. No other lesions were present. Vision improved and there was an increase in the size of the vessels after paracentesis was made.

The reduction in the size of the arteries, as a rule, is the only ophthalmoscopic appearance present, although the optic disc may be pale and its outlines indistinct. There is usually total blindness, and the attack may come on suddenly or gradually and last from a single moment to several weeks. The trouble has been supposed to be due to reduced heart's action, and, by von Graefe, attributed to some obstructive cause within the optic sheath.

**TREATMENT.**—When the anæmic condition of the retina is complete (vision entirely lost), paracentesis or iridectomy, to diminish the intra-ocular tension, becomes necessary. Inhalation of Nitrite of Amyl will be of service. We sometimes observe a partial anæmia of the optic nerve and retina associated with and dependent upon general anæmia. These cases should be treated by the administration of those remedies indicated by the general condition of the patient, as Calc., China, Ferrum, Phos., Puls., etc.

Agaricus has cured cases accompanied by a tendency toward chorea.

**Embolus of the Arteria Centralis Retinæ.**—An embolus may become lodged in the central artery of the retina, or in any of its branches. It is only rarely that the circulation becomes completely stopped. As the retina has an independent circulation of its own with no provision for collateral circulation in case of obstruction, its nutrition ceases at any stoppage of the central artery.

**SYMPTOMS.**—There is nearly always sudden loss of sight, without pain or external symptoms. Occasionally there is slight gid-

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\*Archiv. Ophthal., vol. iv., p. 448, 1875.



diness and headache, flashes of light and some uncertainty of vision preceding the sudden onset of blindness. The field of vision, in complete obstruction, is lost in all directions, as there may be even no perception of light in these cases. If one of the branches is involved there may be simply a loss of the field of vision in one direction. The pupil may be somewhat dilated and will not respond to light. The tension may be either increased, decreased or normal.

The optic nerve becomes paler and of a grayish-white appearance from a diminished amount of blood in its capillaries. The retinal vessels appear thin and contracted, the arteries can only be traced for a short distance into the retina, while the veins present a contraction as they pass from the disc, but become fuller again toward the periphery of the fundus. Minute hæmorrhages in the vicinity of the macula or disc are sometimes found. There is a whitish opacity of the retina, especially in the region of the macula and around the disc. This opacity may come on within a few hours or it may be delayed a week and after a time it begins to disappear. The opacity of the retina probably occurs in the inner layers, which receive their blood supply from the retinal arteries. In connection with the appearance of the opacity around the macula there is seen a cherry red spot corresponding to the position of the fovea centralis. This bright red spot is due to the red color of the choroid shining through the thinned retina and is less likely to form when the stoppage is in some of the retinal branches. After some weeks the optic disc undergoes atrophy, the retinal opacity subsides, the arteries show a white streak and may become converted into white threads; if hæmorrhages have occurred they undergo degenerate changes.

The diagnosis depends upon sudden blindness in one eye, the ophthalmoscopic picture already described, and the discovery of an endocarditis, valvular disease, or some other source of an embolus.

When the embolus becomes lodged in one of the branches it may sometimes be seen with the ophthalmoscope, but as a rule the diagnosis is made on account of a swelling in the artery at some point with an obliteration of the vessel beyond. The visual disturbance is limited to a scotoma of the portion of the field involved.

**Thrombosis of the Vena Centralis** will present appearances very similar to those of an embolus of the artery, but with more inflammatory symptoms, simulating to some extent retinitis hæmorrhagica. In complete stoppage of the vein the optic disc will be nearly obliterated by hæmorrhage, there will be numerous hæmorrhages throughout the retina and especially along the course of the vessels, and, together with these, yellowish patches of exudation. The veins will be enlarged and tortuous and the arteries small and straight, and there may be a diffuse opacity of the retina. Thrombus usually occurs in old people with atheromata, and orbital cellulitis from erysipelas is frequently a cause.

In partial plugging of the vein there will be less opacity of the retina and fewer hæmorrhages, the veins will be enlarged and the arteries contracted. Vision is wholly or partially destroyed, and there may be recurrences of the hæmorrhage. Interesting cases of thrombosis of the central vessels were reported by Loring\* which he had previously reported to the American Ophthalmological Society as cases of embolism. Later Angelucci gave the following differential diagnostic points:

“*Embolism*.—Normal course of vessels, arteries narrowed, veins gradually increasing in calibre toward the periphery, no venous pulsation, absence of retinal hæmorrhages.

“*Thrombosis*.—Tortuosity of vessels, arteries of normal calibre or nearly so, veins gorged with blood and here and there interrupted, venous pulsation and retinal hæmorrhages.”

**CAUSES**.—Valvular disease of the heart, especially when complicated by an acute endocarditis, is the most frequent cause of embolism. It occurs also in diseases of the kidney and in aneurisms. While a thrombus generally results from a phlebitis and also in cardiac diseases. Embolism may occur at any age and usually affects but one eye.

**PROGNOSIS**.—This is always unfavorable, as embolism of the central artery, when complete, almost invariably leads to blindness. In some cases there will at first apparently be some improvement, but even in these cases optic nerve atrophy is apt to follow. When, however, a branch, instead of the main trunk, is involved, the prognosis is, of course, more favorable.

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\* Amer. Jour. Med. Sci., April, 1874.

**TREATMENT.**—But little if anything of value can be done for this condition. Operations to reduce the intra-ocular tension, in hopes of restoring the circulation, such as sclerotomy and paracentesis, have been practiced. Inhalations of the Nitrite of Amyl have been credited with curing some cases of embolism.

Vision may, in exceptional cases, return without any treatment, though it is better to give those remedies which seem to be constitutionally required.

By reference to *Opium* a case will be found described in which a cure was effected. Whether or not this was due to the Opium administered is a question.

**Hyperæsthesia Retinæ.**—Over-sensitiveness of the retina to light may be a symptom of inflammation, but it also results from close application of the eyes at fine work. It may also be found in neurotic or hysterical subjects and may or may not be associated with refractive errors.

**SYMPTOMS.**—There is a dread of light, which may be so intense that the subjects will shield their eyes from all light, and it often results in a blepharospasm. There is frequently lachrymation and more or less neuralgic pains around the eyes and head. The vision is not at all affected, but we find many of the asthenopic symptoms so often present in refractive errors, such as fatigue upon using the eyes, with some blurring of near objects. Upon ophthalmoscopic examination we may find slight congestion of the disc and retina. In the higher degrees of irritation the outlines of the disc become ill-defined. Loring believes that atrophy of the optic nerve may be excited by a chronic condition of irritation.

**TREATMENT.**—If dependent upon any anomaly of refraction, the proper glass must first be prescribed.

In rare, severe cases it may be necessary to confine the patient in complete darkness for a week or more and then gradually accustom him to the light. Though usually it is better to advise *exercise in the open air*, having the eyes protected by smoked or blue glasses, or a shade. Especial attention must be paid to the general health of the patient.

**Belladonna.**—*Hyperæsthesia of the retina*, particularly if dependent upon some anomaly of refraction or reflex irritation. *Eyes very sensitive to light*; cannot bear it, as it produces severe

aching and pain in the eye and even *headache*. Flashes of light and sparks observed before the vision. The eye symptoms as well as the headache are usually aggravated in the afternoon and evening.

**Conium.**—*Over-sensitiveness of the retina to light*, especially if accompanied with asthenopic symptoms, so that one cannot read long without the letters running together; with pain deep in the eye. Excessive photopsies, but fundus normal in appearance. Photophobia. Everything looks white.

**Natrum mur.**—Hyperæsthesia of the retina, especially from reflex irritation in chlorotic females; there is great photophobia, with muscular asthenopia; some conjunctival injection; *eyes feel stiff and ache on moving them or on reading*; letters run together on attempting to read; sticking, throbbing headache in the temples.

**Nux vomica.**—When the *photophobia is excessive in the morning* and better as the day advances.

**Ignatia.**—Hyperæsthesia of the retina in nervous, hysterical patients. Great dread of light and severe pain around the eye.

**Lactic acid.**—Hyperæsthesia of the retina, with steady aching pain in and behind the eyeball.

**Macrotin.**—Angell considers Macrotin more widely serviceable than any one remedy. The ciliary neuralgia is usually marked.

**Merc. sol.**—Eyes more sensitive to artificial light, and in the evening.

A large number of remedies which produce marked photophobia may be indicated by the general symptoms and cachexia of the patient, as Acon., Antimon. tart., Ars., China, Gels., Hep., Hyos., Puls., Rhus., Sep., Sulph., etc.

**Commotio Retinæ.**—This term is applied to sudden loss of vision from blows or concussion of the eyeball. An injury from a blow upon the eye may result in an almost complete loss of vision without any immediate evidence of damage having been done; although, after a time, there may be signs of atrophy of the nerve. In more moderate injuries, such as from the cork of a bottle, there may be slight ciliary injection, some contraction and sluggishness of the iris and a grayish haziness of the retina,



especially in the region of the macula. This opacity of the retina is of considerable size and is due to an acute œdema of the retina, which comes on within a few hours and disappears after two or three days. There may be a decrease in the size of the arteries and an enlargement of the veins. Vision may be more or less affected and is not perfectly regained until long after the opacity of the retina has disappeared.

**Glioma Retinæ** (*Fungus Hæmatodes of the Eye, Encephaloid of the Retina*).—Gliomata are the only tumors arising from the retina, and they take their origin from the connective tissue or neuroglia of the retina.

**PATHOLOGY.**—It consists of small cells with large nucleus, and minute processes similar to those of the granular layers of the retina, numerous blood-vessels and a small amount of connective tissue. A glioma most often originates from the inner granular layer, although it may have its starting point in any of the layers of the retina; it may extend either outward or inward from its place of origin and its especial path of extension is along the optic nerve. Its histological features are similar to small, round-celled sarcoma and is often called a glio-sarcoma.

**SYMPTOMS AND COURSE.**—The condition generally first noticed is a bright reflex from the interior of the eye. There is no pain or redness and the anterior part of the eye is normal. When seen early there is noticed, with the ophthalmoscope, a white or yellowish-red tumor, with either a nodulated or smooth surface, and usually blood-vessels are seen coursing over its surface. The retina is generally detached and the lens and vitreous are clear. As the tumor increases the iris and lens become pushed forward and the anterior chamber shallow. The growth continues to increase, causing distension of the eye; pain sets in, the coats of the eye give way and the tumor appears externally. It becomes ulcerated, bleeds easily and exudes a bloody, foetid discharge. Its growth is rapid and soon involves the orbit and temporal regions and presents a huge vascular mass. The choroid and optic nerve become involved—first the medullary portion of the nerve and then the sheath. This causes a thickening of the nerve, and, in this way, extension to the brain. Metastasis may take place to other parts of the body, the patient becomes cachectic and death from exhaustion or brain-disease is the final result.

CAUSES.—Glioma of the retina is either congenital or occurs in infants. It usually appears under the age of ten, and but one case, that of Mervill,\* in a man aged twenty-one, is on record where it occurred after the sixteenth year. Usually but one eye is involved, although both may be implicated simultaneously or in succession.

DIAGNOSIS.—Purulent choroiditis so closely simulates glioma as to be spoken of sometimes as *pseudo-glioma*. The differential diagnosis depends on the history and local appearances. In choroiditis there is the history of previous illness, meningitis or cerebro-spinal meningitis, and often an inflammation of the eye will have been noticed. These two symptoms are the essential diagnostic points, although in choroiditis the mass is apt to be more yellowish in appearance and the tension minus; while in glioma the tension is rarely low and may be increased even before glaucomatous symptoms become evident.

PROGNOSIS.—In glioma the prognosis is always bad, although numerous cases are recorded where the eye has been removed early with no recurrence of the growth, but it is altogether hopeless, if left to its own course. The most common method of death is by an extension along the optic nerve to the brain. If a relapse occurs after enucleation a fatal issue is most certain. Noyes (*loc. cit.*) says: "A single case is given in which the patient survived after removal of secondary tumor." To this may be added a case reported by Dr. Geo. S. Norton,\* where the secondary growth appeared about two and one-half months after the enucleation, with the previous symptoms of constitutional disturbance. This was removed and the fluid extract of Red Clover blossoms (*Ceanothus Americana*) administered. This patient was last seen by the writer ten years later, at which time she was in perfect health and with no signs of any return of the growth.

TREATMENT.—This should always be by operation, and, if the enucleation is made in the very early stage, there is a fair chance of eradicating the disease, which is at this time purely local. In enucleation for glioma it is always best to remove as long a portion of the optic nerve as possible. If the operation is made in the glaucomatous or later stages of the disease, all the contents of the

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\* Trans. American Ophthal. Soc., vol. 2, p. 364.

orbit should be removed. After the growth has perforated the eyeball and becomes of a fungus appearance, operation can only be considered for relief of the pain, as it is then too late to offer any hope of preserving the life.

The use of Red Clover blossoms to prevent the recurrence of glioma, after operation, seems from the case reported by French† and Norton (*loc. cit.*) to be worthy of a trial in all cases of this malignant disease. So far as we have been able to find, no other medication has ever proved of any value.

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\* Journ. Ophthal., Otol. and Laryngol., vol. 2, April, 1890.

† Trans. Amer. Inst. Hom., 1884.

## CHAPTER XIX.

## Diseases of the Optic Nerve.

**Anatomy.**—The optic nerve extends from its terminal expansion, the retina, which receives visual impressions, to the brain centres, where perception takes place. It may be divided for its anatomical considerations into three separate regions—cranial, orbital and intra-ocular portions.

Each optic tract arises by two roots, of which the *external* is made up of fibres arising from the corpus geniculatum externum, from the thalamus opticus and from the anterior corpus quadrigeminum. From these ganglia radiating fibres extend to the gray matter of the occipital lobe. The *inner* root of the optic tract receives fibres from the corpus geniculatum internum and from both the posterior and anterior corpus quadrigeminum. Another bundle of fibres comes direct from the cortex of the occipital lobe. Other fibres have been traced as coming through the crus cerebri and along the pons varolii from the posterior columns of the cord. Still other fibres of this internal root come from the corpus dentatum of the cerebellum.

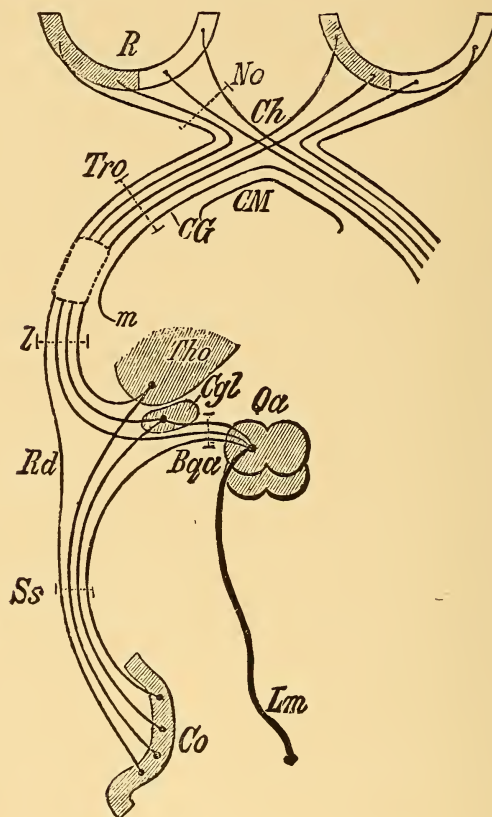
The optic tract formed by the union of these two roots passes forward along the inferior surface of the thalamus opticus, crosses the crus cerebri and unites upon the olivary process of the sphenoid bone with the optic tract from the opposite side to form the optic chiasm or commissure.

In addition to the fibres of the optic tracts, the chiasm has fibres which appear to come from the corpus subthalamicum and serve to connect corresponding parts on opposite sides of the brain. They are known as the commissural fibres of Meynert and of Gudden, and have no direct visual function (Fig. 77). In the optic commissure the fibres of each optic tract undergo partial decussation, the fibres of the right optic tract supplying the right half of each retina and the left optic tract supplies the left half of



each retina. The dividing line in the eye is on the vertical meridian through the macula, while at the fovea there is an intermingling of the fibres from both sides. The orbital portion of the optic

FIG. 77.



Scheme of the central visual apparatus. *R*, retina, shaded where it is innervated by the left, clear where innervated by the right hemisphere; *No*, nervus opticus; *Ch*, chiasma; *Tro*, tractus opticus; *CM*, Meynert's commissure; *CG*, Gudden's commissure; *l*, lateral tract root; *m*, median tract root, *Tho*, thalamus opticus; *Cgl*, corpus geniculatum laterale; *Qa*, nates; *Bqa*, brachia anteriora; *Rd*, direct cortical tract root; *Ss*, sagittal medullary layer of occipital lobe; *Co*, cortex (chiefly of the cuneus); *Lm*, median tract (Schleife).

nerve commences where it passes through the optic foramen from its origin in the optic commissure. From the chiasm to the fora-

men the nerve is about 10 mm. long, and from the foramen to the eyeball it is about 28 mm. long and 4 mm. in diameter. At the optic foramen the nerve becomes invested with a sheath from the dura mater, in addition to the pial sheath in which it has been inclosed in the skull. Between the dural and pial sheaths of the optic nerve is a space which is imperfectly divided by trabeculæ of connective tissue and containing lymph. This space is directly continuous with the arachnoid cavity of the brain. Another lymph space lies beneath the pial sheath, but this is normally only microscopical. The arteria and vena centralis retinae pierce the nerve about 15 mm. behind the eyeball. The central artery does not supply the nerve as a whole, but gives off very minute branches just behind the lamina cribrosa to supply it and the optic papilla.

The pial sheath is a fibro-vascular structure, very closely adherent to the nerve and gives off connective tissue bands which form a network of trabecular tissue between the fibres of the nerve. It receives its blood supply from branches of the ophthalmic artery, and, by its continuity with the pia mater, forms a communication between the intra-cranial and orbital arteries. The pial sheath terminates by becoming blended with the inner layers of the sclera. The dural sheath forms a fibrous covering to the nerve and terminates by blending with the outer layers of the sclera.

The ocular portion of the optic nerve is that part where it penetrates the globe. On passing into the eyeball the sheaths are left behind, as described above, and with them the connective tissue septa separating the fibres turn aside and blend with the sclera. The nerve-fibres, having lost their medullary coat, are continued as naked axis cylinders, and terminate as the optic papilla.

The *Lamina Cribrosa* is made up of fibrous tissue interwoven with the connective tissue sheaths and septa from the optic nerve at the level of the sclerotic opening. This structure is more or less visible with the ophthalmoscope and represents the limit of an ophthalmoscopic view. The optic nerve fibres, in order to gain entrance to the globe, must pierce both the sclera and choroid, which they do through a circular opening. The edge of this opening may be in close contact with the nerve or a small space may be left through which the sclera may be seen. Krause esti-

mates the number of fibres within the optic nerve as high as 400,000.

*The Ophthalmoscopic Appearance of the Healthy Papilla* is that of a circular area, whitish in color, due to the lamina cribrosa, which shines through the transparent nerve-fibres—the white substance of the sheaths having terminated at this point. It generally has a pinkish tint, due to the presence of capillaries, the degree of this coloration varying in different individuals. A little to the inner side of the disc the central artery of the retina is seen to emerge, which usually divides after passing the lamina cribrosa, although it may sometimes have divided before coming into view. The two chief divisions thus formed pass, one upward and the other downward, to the retina. The central vein is somewhat darker in color and larger in size than the artery and accompanies it. There are frequently small lines of pigment bordering the disc at some point.

*The Physiological Cup* is an excavation at about the centre of the disc of a varying extent, but it never reaches to the edge of the disc, as does the cup of glaucoma. It is usually funnel-shaped and more distinctly white in appearance than is the rest of the disc. (See Chromo-Lithograph, Plate II, Fig. 2.) This is due to an exposure of the central part of the lamina cribrosa from the divergence of the nerve-fibres as they turn or bend to pass over into the retina.

*The Sclerotic Ring* is a whitish ring found at the edge of the disc and is caused by the opening in the choroid being somewhat larger than that in the sclera, and thus permitting the sclera to be seen through the transparent nerve-fibres. It is generally more visible at the outer edge of the disc, owing to a greater thinness of the nerve-fibres at that point. The average diameter of the disc is about 1.6 mm., its apparent size varying with the refraction of the eye.

**Opaque Nerve Fibres.**—This is a rather frequent congenital anomaly which generally affects but one eye, though it is sometimes seen in both. The condition is due to the continuance of the opaque medullary sheath of some of the fibres of the nerve for a short distance after passing through the lamina cribrosa of the sclera. Opaque fibres are most often seen extending either

above or below (See Chromo-Lithograph, Plate III, Fig. 10) and appear as a white patch, which runs a variable distance, sometimes ending abruptly, but generally as a striated, fan-shaped margin. The diagnosis of the condition is not difficult; and yet it is sometimes confused with atrophy of the choroid or with the white mound around the disc seen in retinitis albuminurica. In opaque nerve-fibres the white or yellowish patch is, except in extremely rare instances, continuous with and concealing the margins of the disc. The retinal vessels may be wholly concealed or will appear here and there. The striation and flame-like shape of the opaque fibres are also characteristic diagnostic points. The surrounding parts of the fundus are normal and vision is usually only affected by an enlargement of the blind spot.

**Coloboma of the Sheath.**—This is another very rare anomaly which depends upon an imperfect closure of the foetal fissure and is very frequently mistaken for a retraction of the choroid found in myopia. It is often accompanied by a fissure or defect in the choroid; but, unlike choroidal changes, it has no pigment border. There is an apparent elongation downward and backward of the nerve which has a concave look. The nerve runs into the exposed sclera or sheath. The usual location of the coloboma is at the lower part of the disc, though in three cases that came under my observation and reported in the *Journal of Ophthalmology, Otology and Laryngology*, vol. ii., p. 2, 1890, the coloboma was in each instance at the upper part of the disc.

**Hyperæmia of the Disc.**—Simple congestion of the disc is evidenced by an increased redness, it assuming a general dull red hue which shades off into the surrounding fundus so that the outlines of the disc become blurred and indistinct. In addition to the appearance of the disc, as seen with the ophthalmoscope, there may be some photophobia, fatigue on using the eyes or slight pains around the eye. Hyperæmia of the disc occurs in all inflammations of the retina and choroid, and may be caused by refractive errors, especially in hypermetropic and astigmatic eyes. It is also common in those exposed for a long period to the glare of a bright light. Cerebral hyperæmia, fracture of the skull, or morbid process at the base of the skull may result in hyperæmia of the optic nerve.



As the normal redness of the disc may vary, being greater in plethoric persons and in those using alcohol to excess, it is always somewhat difficult to say when an abnormal congestion is present.

The *treatment* must be directed to the cause, as it is more frequently symptomatic than idiopathic. The remedies especially to be considered are Bell., Duboisia, Phos. and Pulsat.

**Hæmorrhage of the Optic Nerve.**—When the extravasation occurs in the papilla it is readily seen. It is found to occur where the vessels have become degenerated, as in albuminuria, diabetes, etc. It may also occur in embolism or thrombus of the central vessels, and is perhaps most frequently seen in some form of neuritis or neuro-retinitis. In these cases the vision may be but little affected, unless the fibres going to the macula are involved, when the damage to sight is serious.

Hæmorrhage into the sheath of the nerve behind the eye is more rare and generally results from injury, as fracture of the base of the skull or of the orbit. The ophthalmoscopic signs are not at all indicative of the condition, as they may simply consist in a slight hyperæmia and haziness of the retina, or there may be all the characteristic signs of embolism of the central artery. The vision is as a rule destroyed from atrophy.

**Neuritis Optica** (*Papillitis, Choked Disc.*)—Inflammation of the optic nerve has been divided clinically into several forms, viz.: *Papillitis or choked disc, neuritis descendens* or *neuro-retinitis*, and *neuritis retro-bulbaris*. As all but the last variety present ophthalmoscopic signs and are very similar in appearances, as well as causes and pathological changes, they will be described under the general heading of neuritis optica, while to the last form, neuritis retro-bulbaris, we shall devote a separate space.

**PATHOLOGY.**—The changes in the nerve head consist, first, of a venous hyperæmia and œdema, followed by a hypertrophy of the nerve-fibers, lymphoid infiltration and an increase of the connective tissue, especially that of the neuroglia of the nerve and that surrounding the central vessels. There are also inflammatory changes in the trunk of the nerve and its sheaths. Tubercles have been found in the sheaths of the nerve in cases due to tuber-

cular meningitis, and in suppurative meningitis pus cells are found, not only in the spaces between the sheaths but also in the connective tissue of the nerve itself. In syphilitic neuritis there is thickening from hypertrophy and cell infiltration of the interstitial connective tissue and pial sheath. Later on the pressure from the increased size of the nerve results in an atrophy of the nerve-fibres. The atrophic changes of the nerve in choked disc are described at length by Ulrich.\* In some cases where there is less thickening of the connective tissue, gray atrophy ensues, in which the nerve-fibres are preserved, but become smaller through loss of their medullary sheath.

**SYMPTOMS.**—There are no external signs of neuritis, excepting in some cases a dilatation of the pupils, and, when present, is generally in those cases where central vision has been lost for some time, and in complete blindness the pupil is not only dilated, but is often immobile. Pain is only present in those cases due to some orbital affection, when there may be some tenderness on pressure. The vision in neuritis is sometimes perfectly normal, and yet the ophthalmoscopic picture of inflammation of the optic nerve be quite characteristic. This fact illustrates the importance of an ophthalmoscopic examination in all cases, even though central vision be perfect. Usually there is, however, more or less impairment of vision even to mere perception of light, which may have come on quite rapidly or more often gradually. In some cases of an œdematous papillitis the vision will remain normal for several weeks and then commence to gradually fail, while in other cases it will be impaired from the first and steadily become worse.

The field of vision may be variously affected, sometimes remaining normal; again it may become concentrically contracted, or it may be irregularly contracted in different sections. Hemianopsia, absence of half of the visual field, may be present and be either horizontal or vertical, and indicates the origin of the neuritis to be intra-cranial. There may be a central scotoma, due to an enlargement of the normal blind spot from swelling, or there may be an abnormal scotoma, due to involvement of the axial fibres. Color sense may or may not be lost, and, when it fails, generally does so in the usual order of green first, then red and blue last. The loss of color perception is generally proportionate

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\* *Archiv Ophthal.*, vol. xviii., 1, 1889.

with the loss of central vision and affords an indication as to the course of the disease. If the vision and color sense fail gradually and proportionally, atrophy may be expected to follow, and, in cases where recovery takes place, the visual field and color perception return proportionately.

*The Ophthalmoscopic Appearances* vary greatly, but in every case there is hyperæmia, haziness and swelling, or wooliness, of the disc, with increase in the size of the central vein. In severe cases the swelling of the disc is excessive, the central vein enormously distended and the artery contracted. Flame-shaped hæmorrhages on or near the disc are often present and sometimes white spots of exudation are found in the retina. The media and remaining portions of the fundus are normal.

In *Papillitis*, or *Choked Disc*, we find in its simplest form a serous infiltration, causing an excessive swelling, with redness of the disc and engorgement of the retinal veins. To this may be added other inflammatory changes, resulting in a grayish exudation into the disc and surrounding retina, with sometimes hæmorrhages. When both eyes are affected one is usually more so than the other and one nerve is apt to be affected before the other. The swelling in a marked case of choked disc, due to serous infiltration, forms an almost globular, bright red mass of marked prominence, projecting into the vitreous several mm., whose outlines shade off into the surrounding retina. The retina may or may not be infiltrated, its arteries are small, but the veins are engorged. These cases are very similar to those of neuritis descendens and are most frequently found affecting both eyes, as is the rule in almost all cases of papillitis, when of intra-cranial origin. Monocular papillitis, due to cerebral tumor, usually affects the eye to the opposite side of the tumor, but in all cases of neuritis affecting but one eye the cause is generally below the optic chiasm. Fick says choked disc is due less to inflammatory round cell infiltration than to the dilatation of the vessels, the saturation with serum, and the thickening of the non-medullated nerve-fibres. Yet actual inflammation is never quite lacking, and an infiltration with round cells and hypertrophy of interstitial tissue occurs sooner or later.

In *Neuritis Descendens*, or *Neuro-retinitis* the ophthalmoscopic appearances, while somewhat similar to those of papillitis, are not so well marked. There is less swelling of the disc, its outlines are

indistinct, the arteries small and the veins enlarged. (See Chromo-Lithograph, Plate III, Fig. 3.) The disc is opaque and of a deep red color and there is apt to be an infiltration along the retinal vessels. There are often more extensive changes in both the nerve and retina; they become swollen and infiltrated, hæmorrhages occur and white patches appear in the retina in the vicinity of the macula and disc. These patches in the neighborhood of the macula often assuming the stellate appearance seen in retinitis albuminurica.

**COURSE.**—The duration of optic neuritis will vary greatly in different cases. In some the disease will reach its height in two or three weeks, remain stationary for perhaps a similar period and then subside, the nerve returning to its normal condition. These cases are often dependent upon a meningitis which runs its course before the neuritis may be said to have reached its height. Other and more severe cases may develop rapidly, but the subsidence of the neuritis will be very slow—taking weeks or months—and the symptoms are replaced by those of atrophy. A case of choked disc has been reported by Matthewson\* in which the appearance of the nerve remained unchanged for three years.

**CAUSES.**—It is impossible to differentiate the various forms of neuritis from the cause, for, while papillitis often indicates a cerebral or intra-cranial disease, still a neuro-retinitis may originate from similar conditions. If the neuritis is monolateral the cause is probably of local origin, depending upon some disease in the orbital region, as caries, periostitis, tumors and cellulitis, or of some disease of the surrounding structures, such as the frontal sinus or the antrum of Highmore. If bilateral, it is in the majority of instances due to some diseased condition of the brain, of which tumors (syphiloma, tubercle, glioma, and abscess) are by far the most frequent cause. Neuritis resulting from tumor of the brain is usually the most intense kind (choked disc) and does not seem to depend upon their size or location, although tumors involving the cerebellum are considered the most apt to cause this lesion, while those of the convexity of the brain are least liable to cause optic neuritis. Next to cerebral tumors, tubercular meningitis is the most frequent cause. In addition to these local and cerebral causes we may find neuritis appearing in constitutional disturb-

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\* Trans. Fifth Internat. Ophthalm. Congress, p. 613, 1876.



ances of various kinds among which may be mentioned syphilis. Horstmann\* gives the description, together with the field of vision, in eight cases of specific optic neuritis. It may also be found in severe febrile diseases, such as typhus, variola, etc., from toxic agents, such as lead, albuminuria, etc.; in anæmia, especially when occurring in youth; in females with menstrual disturbances; from simple exposure to cold and rheumatism. It occurs in all ages and may be congenital. Several cases of optic neuritis have been found accompanying acute myelitis which was located in the lower and middle portions of the cord. The course of the extension in these cases has not been demonstrated, but in all probability takes place along the fibres of the optic tract which have been traced to the posterior columns of the cord.

The method by which an intra-cranial disease causes neuritis optica has been the subject of much research and controversy. We believe the weight of opinion to-day has abandoned the earlier theories and accepts now what might be called two methods of extension, the mechanical and the inflammatory. In the mechanical it is due to hydrops of the sheath resulting from increased pressure within the skull, forcing the cerebro-spinal fluid forward between the sheaths of the optic nerve, causing, through compression on the nerve, an œdema and neuritis. In the inflammatory theory, which seems to be supplanting the mechanical, there is found evidence of inflammation in the nerve and its membranes, and even in the nerve head and retina itself. The assumption is that germs or some chemically acting material is carried from the brain to the papilla, by the lymph current where its destructive influence is developed.

PROGNOSIS.—This depends chiefly upon the cause and severity of the disease. In all cases of neuritis optica the prognosis should always be guarded, as more or less loss of vision is apt to result from atrophy of the optic nerve. If due to some grave cerebral or general disease, it is of course unfavorable; but, if there is no incurable disease causing the optic nerve lesion, then the eye trouble may be relieved. The progress of the neuritis is indicated as already mentioned by the progress of the visual and color sense. In neuritis from meningitis, or cerebro-spinal meningitis, useful

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\* Archiv. Ophthalm., vol. xviii., 2, 1889.

vision may sometimes be recovered, especially if the primary disease is rapidly controlled or when the optic nerve has become involved only in the later stages of the disease; but, as a rule, however, more or less atrophy ensues. When the neuritis is due to orbital affections, syphilis, anæmia or menstrual disturbances, the prognosis is somewhat more favorable, as restoration of vision may be more or less complete.

TREATMENT.—As neuritis usually is associated with other and more serious diseases, the treatment will, as a rule, be directed to the general condition or cause of the neuritis. If resulting from some orbital condition, as cellulitis, tumors, etc., treatment as laid down under those headings would be indicated. In some cases of syphilitic neuritis the use of potassium iodide in large doses has given most flattering results. For remedies and their indications, what has been said under *Retinitis* applies to neuritis as well, but a careful study of the *materia medica* may show the true remedy to be one the least thought of.

**Neuritis Retro-bulbaris.**—(*Axial Neuritis, Orbital Optic Neuritis, Central Amblyopia, Toxic Amblyopia*).—This consists of an inflammation of the optic nerve between the eyeball and the chiasm and partakes of the nature of both a neuritis and an atrophy.

PATHOLOGY.—The pathological changes in retro-bulbar neuritis have been the subject of extended investigation, and Samelsohn\* was the first to describe in detail the anatomical changes in this disease. Since then his results have been corroborated by a number of others, among whom may be mentioned the cases of Vossius and Uthoff, reported at a later date in the same archives. More recent papers, to which liberal reference has been made in the preparation of this subject, are those of Knapp† and De Schweinitz.‡ The disease is one of interstitial inflammation followed by atrophy of the axial fibres of the optic nerve, with connective tissue proliferation, which may start at different points. According to De Schweinitz there is an increase of nuclei, hypertrophy of the connective tissue and wasting of the nerve-fibres of a limited portion

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\*Graefe's Archiv., 1882, No. 1.

†Archiv. Ophthalm., vol. xx., 1, 1891.

‡The Toxic Amblyopias, 1896.

of the optic nerve known as the papillo-macular bundle; in fact, that there is an interstitial sclerosing inflammation comparable, according to Samelshon, to the same pathological process that alcohol produces in the liver. The papillo-macular bundle, according to Bunge consist of those fibres in the optic nerve which supply the retina, between the macula lutea and the papilla, and lie in the temporal portion of the nerve-tip in a wedge shaped segment. They occupy about one-third of the surface of the papilla with the apex of the triangle toward the vessels. These fibres gradually approach the axis of the nerve and reach it at the optic canal. In front of the chiasm they occupy the upper and inner portion, but in the optic tract they sink again to the central portion and remain there until they arrive at the brain. This same condition is the lesion in central amblyopia from alcoholism and other similar affections. A certain number of healthy nerve-fibres may be seen in the atrophic parts, which explains why sight may be preserved in isolated spots of the field in persons practically blind from retro-bulbar neuritis and also why they do not become perfectly blind in the amblyopia from alcohol.

**SYMPTOMS.**—Knapp divides the disease into acute and chronic types and details the following symptoms as found in *acute retro-bulbar neuritis*: More or less severe headache; pain in the orbit aggravated by movements of the eye and by pressure upon it; impairment of sight which advances rapidly and may cause blindness within a day or two; central scotoma, for both color and form, which may be partial or complete, the periphery of the field remaining normal; diminished color-perception; moderate congestion and serous effusion of the optic papilla and surrounding retina, which may be followed by ischæmia, or this may be present from the beginning, and the termination of the condition, as shown by the ophthalmoscope, in either a return to the normal with recovery of vision, or a partial atrophy of the disc—always in the temporal half—with a central scotoma remaining, or a general atrophy with total blindness.

**CAUSES.**—Exposure and over-work, acute infectious diseases, such as measles, rheumatism, diphtheria, etc.; poisoning from alcohol, nicotine, lead, opium, etc., and suppression of menses.

**PROGNOSIS** is always uncertain, as many cases will either partially or completely recover, while others will result in perma-

nent blindness, with sometimes the preservation of several islets of sight in the visual field, as already referred to.

In the *chronic* type, or what may, perhaps, be more properly termed *toxic retro-bulbar neuritis*, we find the following symptoms are present:

SYMPTOMS.—There is a gradual loss of vision almost always affecting both eyes, the subjects frequently complaining of a fog before the eyes and that they see better at dusk, or day blindness; there is no pain, either spontaneous or upon pressure; central scotoma, stretching between the fixing point and the blind spot, at first for colors and then absolute; ring scotoma are sometimes noticed; the color-perception is lost for both red and green; and exceptionally for blue (green appears as a dirty white and red as a brownish color); the range of accommodation is diminished; the peripheral boundaries of the visual field are normal, and although direct vision is destroyed, complete blindness is not to be apprehended; the ophthalmoscopic appearances in the earlier stages of the disease may show a slight congestion or a nearly normal condition of the papilla, in the later stages an atrophy of the temporal half or sometimes the lower and outer quadrant of the disc or a general atrophy of the nerve.

CAUSES.—In a large majority of cases it is due to an abuse of alcohol, tobacco, or more frequently of both, and hence is found almost exclusively in males, and in them not generally until middle life. When due to alcohol it is more apt to be found in those who seldom or never drink to intoxication, but who indulge in frequent drinks daily. Noyes (*loc. cit.*) found, out of 204 cases, that 132 were due to these causes. The remaining cases in the table cited by Noyes were due to diabetes, lead, bisulphide of carbon, syphilis, multiple sclerosis, cold, menstrual disturbances, pregnancy, loss of blood from abortion, anomaly of heart, periostitis orbitæ, and in 32 cases the cause was unknown. Many other drugs, such as iodoform, the coal tar products, arsenic, quinine, salicylic acid, etc., are also causes of toxic amblyopia. That tobacco alone can cause a retro-bulbar neuritis has been denied by some, but sufficient cases have been reported to make it certain in our opinion that it may.

PROGNOSIS.—In the early stage, before atrophy of the optic nerve has occurred, the prognosis may be considered favorable, as



more or less complete recovery may be expected if the patients will give up their use of tobacco and alcohol. In some cases the sight will return to normal, even though triangular atrophy of the disc remains.

**TREATMENT.**—When due to alcohol or tobacco, *total abstinence from all spirituous liquors and tobacco* must be strictly enforced; after which our attention should be turned to those remedies which will restore the whole system to its natural tone. The hypodermic injection of strychnine has proven of value in some cases that would not yield to other remedies.

**Nux vom.** has been, and probably always will be, the most important and most commonly indicated remedy in this trouble. The results following its use are often marvelous. There are no marked eye symptoms in this disease, and therefore nothing to guide us to this drug with the exception of the cause.

**Arsenic** seems especially adapted to loss of vision dependent upon the use of tobacco, and has proven clinically to be of the first value in retro-bulbar neuritis.

**Terebinth.**—Amblyopia potatorum, with dull aching pain in the back and dark-colored urine.

**Atrophy of the Optic Nerve.**—This disease may occur in any part of the nerve from the eye to its origin, and, when present, may extend in either direction. Atrophy may be sub-divided into non-inflammatory and inflammatory types.

*Non-inflammatory* (simple, primary or genuine) atrophy is that form where the wasting away of the nerve substance has not been preceded by visible signs of inflammation, although Loring believed that all cases, if seen early enough and examined with sufficient care, would have shown evidences of inflammation.

*Inflammatory* atrophy is that form occurring as the result of a neuritis or a retinitis. This variety is also sometimes spoken of as a neuritic or retinitic atrophy.

**PATHOLOGY.**—Atrophy consists of changes in all the nerve elements; there is a degeneration of the nerve-fibres, and interspersed between the fibres are found fat globules, granular cells and amyloid corpuscles; there is an increase of the connective tissue; the walls of the blood-vessels become thickened and their calibre reduced; the nerve-fibres are reduced to an indifferent structure;

the whole nerve becomes smaller and appears to be changed into a cord of connective tissue. The medullary substance is first affected. In gray atrophy, in addition to these changes, the nerve assumes a gray, translucent and jelly-like appearance and a gelatinous substance may be found around the vessels.

**SYMPTOMS.**—The loss of central vision varies all the way from a slight depreciation to blindness, and, if both eyes are affected, it is apt to be more advanced in one than the other. The contraction of the field of vision is always a well-marked defect, but is not indicative of the cause of the atrophy; it usually commences as a concentric, peripheral narrowing. The limitation may begin in any direction and as a rule advances concentrically, but is usually well advanced before central vision begins to decline; hence, if there is any paleness of the nerve or suspected atrophy, the field of vision should be carefully examined. Occasionally we find an irregular contraction of the field, which will cause a peripheral scotoma corresponding to the defect and it may occur either with or without concentric narrowing. Central scotoma which points to a lesion of the macular fibres is rarely in the earlier stages, yet it may occur. Hemianopsia, or complete loss of one-half of the visual field, may also be found. In this the same side of each eye is usually affected, although it has been seen in simple atrophy affecting the inner half of each retina, and in this respect simulating the limitation due to cerebral disease.

There is always a defect in the color vision in all kinds of atrophy. Green is usually first affected and is confounded with the gray or yellow colors; following the loss of the green will be that of the red, blue, yellow and white in the order named, although exceptionally red may be lost first. Contraction of the color-field is usually much greater than that for form. Dilatation of the pupil is often present in complete atrophy, and frequently will show no contraction when light is thrown into the eye, but may do so in the act of convergence. When atrophy is present in but one eye, and the pupil makes no contraction from the stimulus of light thrown into that eye, if the light be thrown into the unaffected eye instant contraction will take place in the diseased eye.

The ophthalmoscopic appearances in atrophy of the optic nerve are always distinctive and characteristic. (See Chromo-Lithograph

Fig. 5, Plate III.) The first change is the reduction in the amount of the circulation, which first affects the capillaries at the outer part of the disc because they are less numerous in this location. Diminution in the amount of the vascularity in the temporal part of the disc results in a slight paleness, in contrast with which the vessels from the nasal side appear more distinct, and on account of this it may be mistaken for a congestion. The paleness then commences on the nasal side and finally extends over the entire surface of the disc. The diminution or disappearance of the capillaries often constitutes all the changes that occur in the vessels, as in some cases the larger vessels will remain normal for years (in inflammatory atrophy vessels are also contracted).

The alteration in the color of the optic disc admits of considerable variations, from a slight gray to a white hue, and sometimes it assumes a greenish or bluish cast. Its outlines are distinct and clear cut, especially so in advanced cases. Much care and consideration is always required to distinguish a slight pathological paleness of the nerve from that which is normal or physiological, as the whiteness of the disc may vary decidedly in health. The paleness of the optic disc in atrophy is due to the want of capillary vessels and to the over-development of connective tissue. Owing to the shrinking or wasting away of the substance of the nerve in atrophy, the size of the disc appears, and is in reality, smaller than normal. The surface of the disc is flattened or concave, and the extent of the concavity will vary, depending somewhat upon the degree of the normal physiological cup; while the depth of the excavation depends upon the degree of nerve-fibre degeneration that has taken place. At the bottom of the excavation in atrophy the lamina cribrosa is usually distinctly seen and has a mottled-gray appearance.

*Inflammatory atrophy* differs from the non-inflammatory, in that the papilla shows connective tissue changes due to organization of the exudate. The neuritic atrophy gives a grayish-white color to the disc, margins ill-defined, veins enlarged and tortuous. Later the disc becomes a bluish-white, smaller in size, clear cut, the vessels contracted, and we do not see the lamina cribrosa as in the inflammatory type. In retinitic atrophy the disc is of a grayish-red color and clouded, margins indistinct and vessels greatly diminished in calibre.

The surrounding fundus, in atrophy following papillitis or retinitis, will frequently show spots of degeneration and masses of pigment here and there, indicating previous inflammatory changes and hæmorrhages. In simple gray or white atrophy these spots are not seen.

**COURSE.**—In optic nerve atrophy the course depends somewhat upon the cause, but is always slow, lasting for months and in many cases taking years to run its course to complete blindness. Non-inflammatory atrophy generally occurs in middle life and men seem to be more subject to it than women. The atrophy of children is as a rule neuritic.

**CAUSES.**—Gray degeneration occurs in sclerosis and paralysis of the insane, but generally as a result of some disease of the spinal cord, especially tabes dorsalis by far the most frequent cause of non-inflammatory atrophy. This atrophy usually comes on in the early stage of tabes and with the Argyll-Robertson pupil and the absence of patellar reflex, which are also often early symptoms, affords valuable aid in the diagnosis of this disease. As to the general causes, Noyes (*loc. cit.*) gives the following table of the causes of atrophy in 183 cases cited by Uththoff:

	Whole Number.	Men.	Women.
Spinal cord . . . . .	59	55	4
Brain . . . . .	41	23	18
Simple progressive . . . . .	22	16	6
After neuritis optica . . . . .	17	13	4
Sudden embolism of arteries . . . . .	8	3	5
Disease and accident in orbit . . . . .	8	3	5
Dementia paralytica . . . . .	7	6	1
Loss of blood . . . . .	4	0	4
Alcoholism . . . . .	4	4	0
Lead poisoning . . . . .	2	2	0
Hereditary . . . . .	3	2	1
Injury . . . . .	3	2	1
Epilepsy . . . . .	2	2	0
Nephritis . . . . .	1	0	1
Railway spine . . . . .	1	1	0
Congenital, with hydrophthalmia . . . . .	1	0	1
	183	132	51

In addition to this table, which only includes causes outside of the eye, could be added many other causes, such as syphilis,



diabetes, menstrual disturbances, colds, malaria, etc., while, from within the eye, inflammatory atrophy may follow from an inflammation of the nerve, retina, choroid, etc. Examination of Uhthoff's table shows a preponderance of cases resulting from lesions of the brain and spinal cord, and this fact has been frequently noticed by other observers, and, hence, examination of the eye is always important in suspected lesions of these structures.

DIAGNOSIS.—In well-marked cases of optic nerve atrophy, the diagnosis presents no difficulties, but in the earlier stages, or where there is but slight paleness of the nerve, it often requires a careful consideration of all the symptoms detailed, with especial attention paid to the field and color perception. As this disease, in the great majority of cases, is due to some disease of the brain or spinal cord it is often necessary to consult the neurologist for a thorough examination of these structures. The differential diagnosis between optic nerve atrophy and glaucoma will be considered under the latter disease.

PROGNOSIS.—In all forms of atrophy of the nerve the prognosis should always be guarded, for, as a rule, it is unfavorable. In some cases, where the originating cause has been controlled, or but transient, as in meningitis—especially when occurring in young subjects—more or less complete recovery has taken place. Other cases will be met with in which there is a remarkable preservation of the sight, as judged from the appearance of the disc and the circulation. In estimating the prognosis, the field of vision should be carefully watched, as it is considered to be more unfavorable where there is a regular concentric limitation than in the irregularly notched field.

TREATMENT.—In true atrophy of the optic nerve very little can be done to restore vision, though we are often able to check its progress by the selection of appropriate remedies as indicated by general symptoms.

The general health requires most careful attention. The diet should be nutritious and light, while tobacco and all liquors must be prohibited. Mental and physical fatigue must not be allowed.

The hypodermic injection of *Strychnia* has proved efficacious in some instances, though its internal administration is usually more satisfactory.

Favorable results have been reported from the use of galvan-

ism, and it seems as though, when properly and persistently used, it should be of value in checking the progress of the disease at least.

**Nux vom.**—Has been followed by more favorable results in this condition than any other remedy.

*Argent. nitr.*, *Arsen.*, *Verat. vir.* and others have been used with advantage.

**Injury of the Optic Nerve.**—This may result from a fracture of the orbital wall, or of the base of the skull, or from the penetration into the orbit of a foreign body, and it results in an atrophy of the nerve.

**Tumors of the Optic Nerve.**—Very few cases of tumors of the optic nerve are on record, and those reported have been of the fibroma, sarcoma, glioma and myxoma type.

**SYMPTOMS.**—There is simply a very slow, gradually increasing exophthalmos, with defective vision. The growths are usually very slow and painless, and the movements of the eye are generally unaffected. There is seen upon ophthalmoscopic examination symptoms of papillitis, the veins are engorged, the papilla œdematous and congested, and later there will be a shrinking of the vessels and white atrophy of the nerve.

**TREATMENT.**—Removal of the tumor is, of course, the only remedy. This should be done, if possible, without removal of the eyeball; but in most instances enucleation has been necessary. The nerve should be severed as far back as possible, so as to include the whole tumor.

As removal of a tumor of the optic nerve without enucleation of the eyeball has only been successfully made in a very few instances, the following successful operation made by Dr. Geo. S. Norton, and reported by the writer in the *Archives of Ophthalmology*, July, 1892, is worthy of record and is reported as taken from his case records:

“Miss J——, age 30, was first seen on September 25, 1890, and gave the following history: The right eye began to protrude ten or twelve years ago, and has steadily increased ever since. For five years she had much sharp pain in the eye, extending to the back of the head and down to the stomach. Examination

shows O. D. V. =  $\frac{1}{20}$ , O. S. V. =  $\frac{1}{15}$ , a protrusion of the right eye directly outward of twenty-two centimetres, which varies at different times, being greater on some days than others and greater during menstruation, and she says that the vision seems to be better when the eye is small. The ophthalmoscope showed the retinal vessels contracted and optic nerve atrophic. The movements of the eye were as good as could be expected from the amount of the protrusion. Is very nervous and would not allow of deep pressure to determine the nature of the growth.

"October 7th.—Eyeball protrudes directly forward so that the posterior portion of the globe is just even with the outer border of the orbit. No pulsation could be detected. Patient very nervous, had a fainting spell with retching just before being put on the table for operation, but recovered after taking some whisky. Ether was given and well borne throughout the operation until after the tumor was removed, when the pulse became so much weakened that a hypodermic of brandy was given. Palpation, after she was under ether, showed a soft, elastic tumor behind the eyeball and connected with it. Aspirating needle inserted at the outer canthus drew out a drop or two of serum. An incision was then made between the superior and internal recti muscles of sufficient size to permit of the finger being passed down to the tumor. Using the finger as a guide, the tissues around the tumor were severed, back to the optic foramen. The nerve was then divided at the optic foramen and afterward severed close to the eyeball. Tumor at once appeared at the opening and was removed. By rotating the eye the cut end of the nerve could be seen, and it appeared clear and white. The socket was washed out with a 1 to 4,000 solution of the bichloride of mercury, the eyeball replaced and covered with the lid. There was but moderate hæmorrhage throughout, yet some infiltration of blood underneath the conjunctiva and into the lids was noticed, so that protrusion appeared about the same as before the operation; a compress bandage was applied, the ice-bag used locally and Aconite given.

"Oct. 21st.—The day after the operation the temperature was  $99\frac{1}{2}$ , pulse 102. The ice was used for three or four days. Patient has had no pain at any time. The eyeball protruded greatly for three or four days, caused by the infiltration of blood

into the orbit and the lids, extending even to the other eye. There was quite extensive chemosis below, so that the conjunctiva protruded greatly, appearing between the lids. Upper lid greatly swollen, but covered the eyeball. This swelling gradually subsided, so that about the sixth or seventh day the lid retracted, leaving the eyeball exposed and the cornea hazy. The eyelid was drawn over the eyeball and held in place by adhesive strips, which were kept on for four or five days. To-day there is considerable haziness of the cornea, but it has diminished greatly. The eye has sunken back into the orbit nearly as much as the other eye. Eye is, however, nearly immovable, especially outward and inward, and stands somewhat outward. The conjunctiva still protrudes between the lids, but is diminishing, and with but slight discharge. No pain or unpleasant sensations.

"Nov. 20th.—Still some swelling at the inner canthus, moderate discharge, cornea a little hazy below, but clearing. Much better movements of the eye.

"Dec. 10th.—Optic disc very white, but from its centre are seen two small vessels running upward for about the distance of the diameter of the optic disc. There are also seen slight choroidal changes. Much less redness of the eye and movements much better.

"May 3, 1892 —Eighteen months after the operation there is little, if any, perceptible protrusion of one eye more than the other. The movements of the eye are a trifle limited in all directions, but the eye stands perfectly straight. An oblique illumination of the cornea shows a very slight opacity. The pupil is slightly dilated, but not as much as one year ago. In fact, the general external appearance of the eye is not noticeably different from the other, and the eye operated upon could only be told by a close examination. The ophthalmoscope shows the optic papilla to be of an extremely white, glistening appearance, with a faint line showing the position of the central vessels; at the upper part of the papilla there appears a leash of small vessels. There are some choroidal changes a short distance from the disc. The fundus appears normal and in the lower part of the field there is seen two good sized retinal vessels."



## CHAPTER XX.

## Amblyopia and Amaurosis.

Under this heading are classed all those conditions where there is either partial or complete loss of vision without any perceptible ocular lesions. The term *Amblyopia* is applied to those cases where there is but partial loss of vision, and *Amaurosis* where the loss of vision is complete. Formerly many cases of loss of vision from excessive use of alcohol and tobacco were classed under the heading of amblyopia, but in the advance of ophthalmological knowledge they have been found to be cases of inflammation of the optic nerve behind the eyeball and are now classed as cases of retro-bulbar neuritis. Hemianopsia, while also considered under this heading, perhaps should not be, because, while there is no perceptible lesion of the eye, the cause is known as due to some cerebral disease.

**Amblyopia ex Anopsia.**—Weak-sightedness from disuse results when a child with hitherto healthy eyes commences to squint, for in an effort to overcome the annoyance of seeing double he learns to suppress by a mental act the image seen by the squinting eye. As a result of this suppression when followed for months and years, there takes place a permanent change in the nervous function of the eye, which is manifested by more or less loss of vision, *amblyopia ex anopsia*. This condition is often associated with high degree of hypermetropia and astigmatism and will usually not excite attention until the child has entered into school life, and is probably due to the fact that, owing to the refractive error, distinct images have never been focused upon the retina. If, however, the condition is not detected until adult life, no improvement is to be expected.

Other cases of amblyopia ex anopsia are due to non-use of the visual function, owing to congenital opacities of the cornea or

lens, from persistent pupillary membrane, or in cases of strabismus in early infancy. There is usually but one eye affected in these cases, and, when the vision is defective in both eyes, nystagmus is often present. Often by bandaging the good eye and thus compelling the squinting eye to perform the function of vision, even for half an hour each day, the development of amblyopia may be prevented. An existing amblyopia can sometimes be benefited by this procedure; but as it has to be followed out for a very long time it is apt to be neglected. Naumow\* in an analysis of 47 cases of death of new-born infants, has found in 12 cases retinal œdema, retinal hæmorrhages into the macula, choroidal hæmorrhages and the beginning of choked disc. The changes were found especially in those who suffered difficult and instrumental delivery, and he believes that congenital amblyopia has its origin in these changes, which are caused by stasis in the vessels of the head.

**Traumatic Amblyopia** may occur from any severe injury to the head, from concussion of the spine or from a direct blow upon the eye. In some of these cases there may be a fracture of the skull or a hæmorrhage along some part of the nerve, which is apt to produce a neuritis; and, having then inflammatory signs in the eye, should not come under the classification of amblyopia. The prognosis of these cases, while often favorable, should, as a rule, be guarded and dependent somewhat upon the severity of the injury.

**Amblyopia from Lightning.**—Cases of loss of vision from a stroke of lightning are usually accompanied by such lesions as burning of the skin, hair or cornea; ptosis is often present and cataract is apt to follow. In some cases there may be a neuro-retinitis, or, later atrophy of the nerve. These cases often have a greater loss of vision than can be accounted for by the recognizable changes in the eye, and hence can only be considered in part an amblyopia.

**Amblyopia from Loss of Blood.**—Loss of sight may take place after severe hæmorrhage and may be accompanied by changes

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\* St. Petersburger Medicinische Wochenschrift, No. 3, 1889.

in the retina or nerve, yet in some cases may present no visible lesions. It has been seen after severe hæmorrhages from various organs, lungs, stomach, uterus, bladder, etc. Both eyes are usually affected in the large majority of cases and in nearly one-half the loss of sight is permanent. Temporary blindness may occur from loss of blood, and is due to the lack of blood supply to the visual centres or to the retina, and in these cases more or less complete recovery may be expected.

**Hysterical Amblyopia.**—Hysterical blindness is more frequently found in young girls and women. It is usually temporary and unaccompanied by other hysterical symptoms. The loss of vision is usually complete, and but one eye is generally affected. These patients will often be made to see by placing a perfectly plane glass in the form of spectacles before the eyes and the result is due to suggestion. There is usually a concentric contraction of the field of vision, hemianopsia and color blindness may result from hysteria, and we have seen other functional disturbances, such as ptosis, blepharospasm and strabismus in hysterical subjects.

**Pretended Amblyopia (*Malingering*).**—The pretense of blindness is not infrequently met with, and, as a rule, these subjects only claim more or less complete blindness in one eye. Simulated blindness may be practiced for various reasons, the most frequent, perhaps, being in order to secure damages after some trivial injury, to excite sympathy, to secure pensions, etc. We have seen blindness claimed from the mere lodgment of a cinder in the cornea, which had been removed, leaving no trace of its location behind.

An exaggeration of an existing defect of the vision is often claimed. In all cases where the amaurosis is claimed to exist in both eyes, its detection becomes extremely difficult and may often only be proven by careful watching of the subject without his knowledge. The action of the pupils may give some clue; if dilated and immovable, the use of a mydriatic may be suspected, for in dilatation of the pupil in true blindness there may be some contraction for the stimulus of a bright light or upon convergence and there is apt, also, to be a shade more of dilatation when the eyes are in a shadow. By bringing an object suddenly before the

eyes in assumed blindness there may be the natural closure of the lids to prevent injury to the eye. Where the loss of sight is claimed to be in but one eye, there are several tests that may expose the deception. The test by causing diplopia is perhaps the simplest. In this a prism of eight or ten degrees is placed before the sound eye with its base up or down, and if the person on looking at a lighted candle fifteen or twenty feet away acknowledges the double images, binocular vision is at once proven. The crossed diplopia test is made by holding a prism of ten degrees base outward before the pretended blind eye, and if it really sees the eye will rotate inward for the sake of single vision. Another test is made by using a strong convex glass before one eye and a plane glass before the other to read the Snellen test type at twenty feet, and, by a reversible frame, make the person use unconsciously his bad eye. Again by paralyzing the accommodation of the good eye, or by placing a strong concave lens in front of this eye, and, if the patient can read, we know it is done with the affected eye. The stereoscope, Snelling's colored type and various other methods are also useful in discovering an assumed blindness of one eye.

In all these tests caution should be taken that the patient does not suspect that you are trying to detect his dissembling. Rather let him infer that you are seeking to find the cause of his amaurosis.

**Hemeralopia** (*Nyctalopia*, *Night-blindness*).—This condition is found quite frequently without any recognizable lesions of the eye and must be considered as distinct from the night-blindness occurring as a symptom of retinitis pigmentosa and other lesions of the fundus. Hemeralopia is a functional complaint due to exposure to strong, brilliant lights, and is more prone to affect those whose systems have become greatly debilitated from the want of proper food. It prevails sometimes as endemic in certain countries, as in Russia, during their protracted fasts; it is frequently found in sailors, from exposure to tropical suns, and is often by them called "moon-blindness;" in soldiers, after prolonged marches; in travelers in the arctic zone and in those who work before furnaces. Hemeralopia is sometimes congenital and then remains unchanged during life.



Persons suffering from night-blindness are found to have good vision during daylight, but, upon the approach of dusk, or when going into a moderately darkened room, the vision becomes greatly impaired. The field of vision is normal and the fundus shows no lesion. The cause of the difficulty is probably a torpor of the retina, and, under favorable conditions, improvement may be expected.

**TREATMENT.**—As the general health is usually more or less impaired in hemeralopia, a generous diet must be ordered. Rest and protection of the eyes from bright light are first required; in severe cases it may be necessary to confine the patient to a dark room with a gradual return to ordinary daylight.

**Lycopodium** is the remedy most commonly needed in this disorder. Many cases have yielded promptly to its use.

Other remedies, as China, Hyos. and Ranunculus bulb, may be required.

**Snow-blindness.**—The dazzling of the snow may produce a contraction of the visual field, scotoma and night-blindness from torpor of the retina. (See retinitis nyctalopica.) In other cases it will cause intense photophobia, pain, blepharospasm and result in an acute conjunctivitis, or sometimes an ulceration of the cornea.

**Color Blindness.**—Inability to discriminate colors is usually congenital, but may occur in diseases of the retina, optic nerve, brain or spinal cord, and consists of some impairment of the function of the retina. When not the result of disease, the subjects's vision may be in every other respect perfect. He will simply be unable to detect certain colors, as red, green or blue, when partial, and, when complete, all colors will be indistinguishable, simply black and white being recognized. Red is the color for which blindness is most frequently present, while the varying shades of green are next most frequently lost. Numerous theories have been advanced to explain the phenomena of color-blindness, of these the Young-Helmholtz and the Hering are the more generally accepted.

The *Young-Helmholtz* theory originally suggested by Thomas Young, in 1807, who considered that there were three sets of

color-perceiving elements in the retina, corresponding to the fundamental colors, red, green and violet, and that all other colors are mixtures of these sensations. This assumption was modified by Helmholtz, who suggests that all colors excite the red, green, and violet elements at the same time but in varying degrees of intensity.

According to this theory red-blindness is due to absence or paralysis of the organs perceiving red, and that therefore the red-blind have but two fundamental colors—green and violet.

The red colors then exciting only the organs for green and violet, and the latter but very slightly appear to the red-blind as a green of feeble intensity, while the light shades of red do not excite the organs for green, in the red-blind, sufficiently to even create the sensation of green but appear to them as black. The sensation of green excited by red rays in those who are red-blind is of a less degree of brilliancy than the green colors appear to them, because red does not stimulate the fibres for the perception of green to the same extent as does green. In this way the red-blind is generally able to distinguish red from green, not by the difference in color but by the difference in brilliancy. By experience he learns to recognize reds from greens and may go through life without being aware of any defect.

As the man with red-blindness only distinguishes between red and green of equal brilliancy by the fact that the red appears darker, we can by decreasing the brilliancy of the green find a shade which will excite exactly the same sensation as does the red, and he is then unable to tell the two colors apart. Such colors are known as confusion colors and are used to detect color-blindness.

In green-blindness the case is of course reversed, the elements perceiving green being either absent or paralyzed, the green-blind having only the red elements excited by green it appears to them as red.

*Hering's* theory is based upon an analysis of the sensations received when looking at a color. All colors excepting four primary colors—red, green, blue and yellow—excite in us a mixed sensation. These primary colors form two pairs, red and green and yellow and blue, each color being antagonistic to its mate. They are also known as complementary colors, because when mixed in proper proportions they neutralize each other and produce the

sensation of white. These pure colors excite in us a simple, unmixed sensation, but other colors excite a mixed sensation, as, for example, orange gives an impression of both yellow and red. According to Hering's theory, both white and colored light cause chemical changes in the retina or its visual substances, which he says are of three kinds, the white-black, the red-green, and the blue-yellow. He believes color-blindness to be due to the absence of one or both of the colored visual substances. In red-green blindness there is absence of the red-green visual substances and this variety is quite common. The blue-yellow blindness is very rarely found, if both the colored visual substances are absent there is total color blindness, this form is extremely rare, and, in fact, its existence is denied by some.

To the red-green blind both red and green appear white or gray. This variety of color-blindness is found in about four per cent. of males, and in about one-fourth of one per cent. in females.

Color-blindness causes no trouble excepting to those in certain callings, as painters, railroad and nautical service, etc.

Heredity seems to play an important rôle in the occurrence of color-blindness.

There are upward of forty different tests that have been suggested for color-blindness, but the best is that made by Holmgren's wools, which consists in having the observer select from a heap of wools of various shades those that correspond to the one given him as a test object. There are three tests to be made. The first will detect all those who have any defect of color-vision, and the others show the nature of the defect.

In the first test, a skein of light pure green, rather freely mixed with white, is used and the patient required to select all the corresponding shades of green. If he selects any of the confusion colors, viz.: grays, drabs, yellows, rose and salmon, or hesitates and shows doubt as to whether he should choose one, then he should be subjected to the second test. For the second test a bright shade of purple (rose) is taken as a test; the confusion colors are blues, violets, grays and greens. If the patient be *red-blind* he will choose the *blue* and *violet*, because purple being composed of red and violet or blue, is to the red-blind identical with the two latter colors; while if he be *green-blind*, he will choose a *gray* and *bright green*. For the third test a bright red skein is selected, the con-

fusion colors for this being the dark and light shades of green, and brown or olive. The red-blind chooses a green and dark brown; while the green-blind selects a green or lighter brown.

In *acquired color-blindness* there is impairment of the visual acuity. There may be constriction of the field both for white and colors, or in some cases a normal peripheral field with a central color-scotoma. Acquired color-blindness is usually dependent upon some disturbance of the conducting nerve-fibres, as in neuritic atrophy or toxic amblyopia. In neuritis the vision may be but slightly impaired and the field for white but slightly contracted, and still we may find color-disturbance, from a slight limitation for a single color to total color-blindness. In atrophy of the optic nerve, together with the decrease in the vision and concentric contraction of the field for white, we have failure of the color-sense first for red and green and last of all for blue. In toxic amblyopia, especially when due to alcohol and tobacco, there is in the earlier stages a relative scotoma for red and green. There may be peripheral defects for the same colors, and in rare cases a small central scotoma for blue. In toxic amblyopias the *relative* scotoma, *i. e.*, for colors, in the later stages as the disease progresses becomes an *absolute* scotoma, blind to light of any kind.

**Hemianopsia** (*Hemiopia*, *Hemianopia*).—Obscuration of one-half of the visual field almost always involves both eyes. The division is almost universally vertical, although cases have been reported in which the upper or lower half of the field has been lost.

*Vertical hemianopsia* may be of three varieties. The most frequent form is that of *homonymous hemianopsia*, in which the corresponding half of the field of each eye is wanting. Thus the right half of the field, from the patient's point of view, is lost, and is due to a loss of function in the left half of each retina and is called right homonymous lateral hemianopsia, and is *vice versa* when the left half of the field of each eye is wanting.

*Temporal hemianopsia* (or heteronymous lateral hemianopsia) is where the external or temporal half of the field of each eye is blind. The form of hemianopsia is due to loss of conducting power in the nasal halves of the retina and results from pressure or disease at the angles of the commissure or the inner strands of



the optic nerve just before reaching the chiasm. This form comes on less suddenly than the homonymous.

*Nasal heteronymous hemianopsia* is where both nasal fields are wanting and is the most rare form of vertical hemianopsia.

In the two last forms of heteronymous hemianopsia the dividing line is apt to be irregular, while in homonymous cases the line of division is usually distinct and vertical.

*Horizontal hemianopsia* may occur in diseases of the eye or possibly from some lesion causing pressure upon the lower or upper part of the optic nerve or chiasm, or downward upon one optic tract.

*Monocular hemianopsia* may occur from a lesion of one optic nerve in front of the chiasm and, as a rule, has an irregular boundary line.

*Hemiachromatopsia* is where the color sense in corresponding halves of each eye becomes lost. This is an extremely rare condition and but very few uncomplicated cases are on record. The lesion is probably in the cortex.

In a defect of the light sense where there is a corresponding defect in the form and color sense it is called absolute hemianopsia. In cases where there is defect for form, with an equal defect for colors, the light sense remaining intact, it is called relative hemianopsia. Wilbrand\* concludes that the centre for form lies between the centres for color and light sense and that the centre for color occupies the most central position in the brain. When the hemianopsia is partial the defect is usually of an equal extent in both eyes. The reaction of the pupil in hemianopsia is always a valuable diagnostic sign, and the examination of the pupil should be made in a dark room, the eye illuminated with a weak light, while an intense light is thrown obliquely in various directions into the pupil. According to Wernicke, if, in hemianopsia, the light thus thrown upon both the seeing and blind sides of the retina causes contraction, the lesion is back of the primary optic centres. If there is contraction when the light falls upon the seeing side of the retina and none when it falls upon the blind side, the lesion is either in or in front of the primary optic centres. Peripheral contraction of the field that remains in hemianopsia in-

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\* Hemianopsia. Berlin. 1881.

FIG. 78.

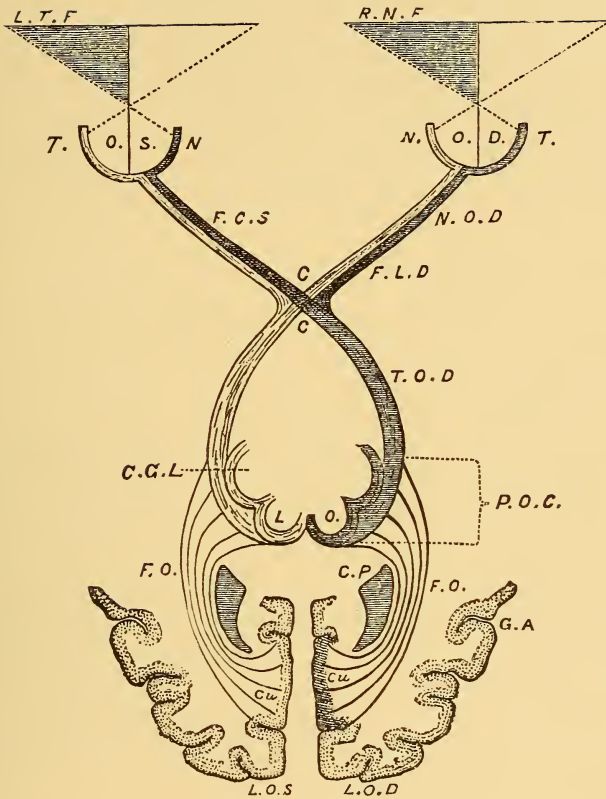


Diagram illustrating the visual path and its relation to the visual field, left lateral hemianopsia being shown (Seguin). L. T. F., left temporal half-field; R. N. F., right nasal half-field; O. S., oculus sin.; O. D., oculus dexter; N. T., nasal and temporal halves of retinae. N. O. S., nervus opticus sin.; N. O. D., nervus opticus dext.; F. C. S., fasciculus cruciatus sin.; F. L. D., fasciculus lateralis dext.; C., chiasma, or decussation of fascicula cruciati; T. O. D., tractus opticus dext.; C. G. L., corpus geniculatum laterale; L. O., lobi optici (corpus quad.); P. O. C., primary optic centres, including lobus opticus, corp. genic. lat., and pulvinar of one side; F. O., fasciculus opticus (Gratiotlet) in the internal capsule; C. P., cornu posterior; G. A., region of gyrus angularis; L. O. S., lobus occip. sin.; L. O. D., lobus occip. dext.; Cu., cuneus and subjacent gyri constituting the cortical visual centre in man. *The heavy or shaded lines represent parts connected with the right halves of both retinae.*

indicates some additional complication. Pressure on the insensitive sides of the eye will not cause phosphenes. Ophthalmoscopic ex-

amination shows no lesion, except in the later stages of the disease, when there is sometimes a paleness of the papilla.

Lateral homonymous hemianopsia usually develops suddenly and is often associated with hemiplegia, and at times diminution of the cutaneous sensibility. If on the right side of the field it may be accompanied by aphasia. The line of demarcation is usually nearly vertical at the point of fixation. Transient hemianopsia, and generally of the homonymous lateral type, has been noticed.

Mauthner says in right homonymous hemianopsia the right optic nerve will appear atrophic, while the left remains normal. Blindness of the right side of the field causes more trouble in reading than when the left side is gone. Central vision may be either perfect or impaired.

Homonymous lateral hemianopsia results from intra-cranial and generally cerebral disease, which may be either tumors, hæmorrhage, embolisms, injuries, softening, etc. The seat of the lesion may be in any part of the visual tract between the eyeball and the cortex of the brain.

The explanation as to the path through which pathological lesions result in the various forms of hemianopsia has been the subject of prolonged investigation and discussion. The accompanying diagram illustrating the visual paths and their relation to the visual field will give all that seems necessary here. Fuller details in the study of this subject falls under the domain of the neurologist to whom the student is referred.

As to the nature of the lesion, the diagnosis must depend upon the history, nature of the attack and concomitant symptoms; but in all cases of cerebral disease, especially where the ophthalmoscope reveals no lesion, the visual field should be examined.

PROGNOSIS.—Restoration of the visual field is rare, but when it does occur, it is apt to be symmetrical in both eyes. If both hemiplegia and hemianæsthesia are present, the former may disappear and the latter remain. The hemianopsia is usually but one of other cerebral symptoms which may end in death. Nasal homonymous hemianopsia generally affords a better prognosis than temporal.

TREATMENT.—Half vision is usually only a symptom of some

deep disorder of the eye, but as it is sometimes the only symptom to be found those remedies appropriate to it will be mentioned:

Upper half of visual field defective: *Aurum*, *Dig.* and *Gels.*

Right half of visual field defective: *Cyclamen*, *Lith. carb.* and *Lyc.*

Vertical hemiopia, either half invisible: *Calc. carb.*, *Chin. sulph.*, *Mur. ac.*, *Nat. mur.*, *Rhus*, *Sep*, and *Stram.*



## CHAPTER XXI.

## Diseases of the Vitreous Body.

**Anatomy.**—The vitreous humor is the transparent, jelly-like structure occupying the space between the lens and the retina. The vitreous has somewhat of a depression on its anterior surface called the *lenticular fossa* in which rests the crystalline lens, and to the posterior capsule of which the vitreous is attached, while behind, it is adherent to the optic nerve. The presence of a *hyaloid membrane* inclosing the vitreous is claimed by some authorities; but, according to others, the so-called hyaloid is identical with the internal limiting membrane of the retina, which, according to Lieberkuehn, from the developmental standpoint, belongs to the vitreous. The structure of the vitreous has not with certainty been determined. It is claimed that it can be split into concentric layers and various forms of cells have been found in it. These cells are toward the centre roundish in shape and more stellate or fusiform toward the peripheral layers of the vitreous. Chemically the vitreous is 98 per cent. water, with salts, extractive matter and a trace of albumin. Its consistency becomes less as age advances and in adult life is slightly more tenacious than the white of an egg. Its index of refraction is identical with that of the aqueous humor. A canal of about 2 mm. in diameter runs through the vitreous from the optic nerve to the centre of the posterior capsule of the lens, and during foetal life it contains the hyaloid artery. The vitreous contains neither blood-vessels nor nerves, and yet, on account of its cells, it must be considered an organized structure.

**Hyalitis Suppurativa.**—Purulent inflammation of the vitreous may occur when a foreign body has penetrated into it, or it may be the result of an extension of some other inflammation of the eye and generally from an inflammation of the retina, choroid

or ciliary body. It is now generally accepted that a primary hyalitis may occur and manifest itself either as an opacity or it may go on to suppuration. Pus may be found in the vitreous in some infectious blood diseases, and is due to exhaustion and debility. After cataract extraction or the removal of a staphyloma suppuration has sometimes been noticed as beginning in the prolapsed vitreous.

**SYMPTOMS.**—There may be bulging of the pupillary border of the iris and retraction of its periphery. Posterior synechiæ are usually present and the tension is diminished. Together with the inflammation of the iris and ciliary body there is more or less pericorneal injection. Ophthalmoscopic examination will show a light yellowish reflex from the fundus, and, when the pus is circumscribed, the appearance resembles very closely a glioma of the retina and is sometimes called *pseudo-glioma*. It is distinguished from the true glioma by the history, the appearance of the iris and the symptoms of iritis and by the diminished tension. The vitreous is hazy while in glioma it is clear.

**COURSE.**—Suppuration of the vitreous usually results in destruction of the eye. It generally becomes complicated with choroiditis and often extends to a general inflammation of the eye or panophthalmitis. If the active process continues the eyeball ruptures and atrophy follows. Less severe inflammatory conditions of the vitreous, resulting in opacities and more or less destruction of vision may occur and, when it does, it is usually an extension from inflammation of other structures.

**TREATMENT.**—Hyalitis rarely occurs idiopathically, being usually associated with severe inflammations of the fundus, especially inflammation of the whole or part of the uveal tract. The treatment must then be directed to the primary disease. Particularly study the remedies recommended for choroiditis. Traumatic inflammation of the vitreous humor is more frequently observed, especially from a foreign body, which usually necessitates the removal of the eye.

When occurring in cases of great debility from low fevers and if seen in its earlier stages a stimulating, nourishing treatment may save the eye; but, as a rule, when pus has once formed in the vitreous the eye cannot be saved and enucleation is demanded.

**Opacitates Vitrei** (*Myodesopsia*, *Muscae Volitantes*, *Synchysis*, *Synchysis Scintillans*).—Opacities in the vitreous may vary greatly in form and size from a mere diffuse dust-like haziness to large membranous patches or strings. Their color may also vary from a gray to a decided black and they may be either fixed or floating in the vitreous. The diffuse opacities are often so transparent that they will simply appear to hide the retina as through a thin veil, or fine dust, and this form of opacity generally occurs in syphilitic retinitis or choroiditis. In other cases there will be such intense opacities of the vitreous as to obscure all reflex from the fundus, and the diagnosis is made by exclusion by oblique illumination, the presence of any opacity of the cornea, anterior chamber or lens. If this condition results from a hæmorrhage, there may sometimes be seen on the posterior surface of the lens a red appearance from particles of blood which have become attached to the lens capsule. Membranous opacities may often be seen adherent by one or more points to the retina, choroid or disc.

**SYMPTOMS.**—The subjective symptoms depend upon the amount and density of the opacities. Thick, circumscribed opacities cause less impairment of vision than do thin and transparent but diffuse ones. Vision, therefore, may be not at all affected or wholly lost, but, in cases of floating opacities, varies according as the opacity is in the line of vision or not. Patients describe the appearance as gray or black spots of different sizes and shapes and often are able to draw pictures of their appearance.

Opacities of the vitreous are best determined by an examination with the direct method at the distance of about thirty centimetres and, as the patient moves the eye upward and downward, dark spots or streaks are brought into view in the red reflex of the fundus. The movement of the eye may have to be continued for some time before the opacity comes into view. The rapidity of the movement of the opacity increases in proportion to the fluidity of the vitreous and the movement continues after movement of the eye ceases. Vitreous opacities move in an opposite direction to the movement of the eye, while opacities of the lens or cornea move with the movement of the eye and cease as soon as the eye comes to rest. Opacity of the cornea or lens can be recognized by an oblique illumination.

COURSE.—Diffuse opacities may entirely clear up, or they may become aggregated into thick, circumscribed shreds, while the remainder of the mass becomes more transparent. The thick, circumscribed opacities may be somewhat absorbed but more slowly and obstinately.

CAUSES.—Opacities are especially found in myopes, with posterior staphyloma and choroidal changes. They are frequently due to some inflammation of the ciliary body, choroid or retina, or from an injury of the eye which has caused a hæmorrhage into the vitreous. They have also in many instances been due to various general conditions, such as exhaustion after severe constitutional diseases, in anæmia, menstrual disturbances, syphilis, constipation, etc., and have frequently been seen where no cause can be given for their origin.

In *muscæ volitantes* or *myodesopsia* there is no true opacity of the vitreous, and the black spots complained of by patients as floating before the eye when looking at a bright surface are due to shadows upon the retina produced by some normal elements in the vitreous or from small particles of secretions or tears moving over the cornea. In these cases there is no interference with vision and the ophthalmoscope shows no opacity. They will frequently cause great annoyance, especially in nervous individuals, and are generally attributed by the laity to biliousness or indigestion.

*Synchysis* is a fluidity of the vitreous and can only be diagnosed by the rapid movement of opacities in the vitreous during motions of the eye. The tension of the eye is often diminished, but low tension does not necessarily indicate fluidity of vitreous, although soft eyeballs usually contain fluid vitreous. *Synchysis* is more often found in elderly people with staphyloma or choroidal disease. *Synchysis*, when present in cataract cases, may complicate the extraction by loss of vitreous.

*Synchysis Scintillans* is where the fluid vitreous contains numerous scales of cholesterin and tyrosin. When seen it presents, with the ophthalmoscope, a beautiful appearance, as of a shower of brilliant crystals. This condition seems to be associated usually with choroiditis, although it may be seen in eyes presenting no evidence of other disease. The vision, as a rule, is but slightly affected.



**TREATMENT.**—Dense membranous opacities may be torn with a fine needle, though operative measures are not usually required. If the opacity has been recent, especially if hæmorrhagic, a compress bandage should be applied and the patient kept in bed.

If there has been hæmorrhage into the vitreous humor, their absorption may be hastened by Arnica, Bell., Crotal., Ham. virg., *Lach.*, Ledum or Phos. If the opacities are the result of inflammation of the choroid or retina, benefit has been derived from the following: Arg. nit., Aurum, Bell., Gels., Jab., *Kali iod.*, Kali mur., Kalmia, Lach., Merc., *Nat mur.*, Phos., Prunus, Sen., Sil. and Sulph.

**Hæmorrhage into the Vitreous.**—Usually occurs from the vessels of the choroid, retina or ciliary body, and generally results from an injury, such as a blow or wound of the eye or concussion of the skull. The hæmorrhage may be partial or entirely fill the vitreous, being so dense as to wholly obscure the red reflex of the fundus, and then may often be seen as a dark red mass by the oblique illumination. There is partial or total blindness, which may have come on gradually or suddenly. Spontaneous hæmorrhage into the vitreous and retina have been seen to occur. The hæmorrhage will often be wholly or partially absorbed in the course of a few weeks, but more frequently floating opacities remain behind.

**Foreign Bodies in the Vitreous.**—Usually in injury the foreign body will become lodged in the coats of the eye, although it may penetrate into the vitreous. It most generally passes in through the cornea, wounding the iris and lens, or lens alone, and more often becomes lodged either in the iris or lens. In some cases the foreign body will penetrate by the way of the sclera, in which it may be lodged. It may drop into the vitreous; or, passing through the vitreous, become lodged in the coats of the eye at the opposite side, or, penetrating these, may become embedded in the tissues of the orbit. A foreign body within the vitreous usually becomes within a few hours surrounded by a cloudy opacity which may become organized, forming a cyst wall around it, but as a rule, instead of becoming encysted, it will result in inflammation, which may lead to abscess, or, remaining localized,

result in detachment of the retina; or, by an extension of the inflammation, cause panophthalmitis

In some cases the foreign body will remain visible in the vitreous for some time without becoming fixed or encysted, and may lead, when in this condition, to either glaucoma or sympathetic ophthalmia. The entrance of the foreign body is usually accompanied by hæmorrhage from the choroidal vessels. The most frequent foreign bodies are chips of iron, steel, glass and shot—the latter are always more favorable than are other foreign substances. In diagnosing foreign bodies in the vitreous, the history of the injury will be the first clue. We may then find a corneal wound or scar, with evidences of injury of the iris or lens, by the ophthalmoscope. If there is not too great haziness of the lens or vitreous, we may often see the foreign body itself, if a piece of iron or steel, of a bluish or greenish white color with a glistening border.

**TREATMENT.**—Removal of the foreign body by means of the electro-magnet has been successfully done in many cases. The magnet is, of course, only applicable to particles of iron or steel, yet, as these substances form the large majority of cases, its use has been the means of saving many eyes that, previous to its employment, would have been lost. If seen shortly after the injury, before the wound is closed, the opening, if in the sclera, is somewhat enlarged, so that the substance will not be brushed off when the magnet is withdrawn. The needle of the magnet is then introduced through the wound to as near the foreign body as possible. When the substance can be located by the ophthalmoscope the needle can be passed directly to it. If, however, it cannot be seen, the appearance of the wound will often indicate the direction to be followed and a certain amount of exploratory excursions are permissible. If the penetration has been through the cornea and lens, the lens should first be removed and the needle inserted through the corneal opening. Haab\* uses a very powerful magnet applied to the surface of the eyeball, and many successful results have been reported from this method. After the wound has closed, if the substance can be discerned with the ophthalmoscope, an opening may be made in the sclera by means

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\* Bericht d. Ophthal. Gesellschaft zu Heidelberg, 1892.

of a meridional cut through the equatorial part of the sclera and the magnet used. If, however, the substance cannot be discerned, it is better to delay opening the sclera until the eye gives evidence of well developed inflammatory symptoms, as in rare instances it becomes encapsulated and may be allowed to remain, if the patient is made to thoroughly understand the importance of an immediate enucleation of the eye upon the first evidence of sympathetic irritation. Failing in the attempt to remove the foreign body, if the injury has been sufficient to destroy vision, enucleation or evisceration may be employed at once.

The inflammation arising from injuries must be subdued by ice compresses, the instillation of Atropine, and proper internal medication. The remedies will usually be *Acon.*, *Arn.*, *Calend.*, *Ham.*, *Led.* or *Rhus*.

**Cysticercus in the Vitreous.**—The presence of a parasite in the eye is of extremely rare occurrence in this country, but is quite frequently met with in North Germany. Its origin is between the choroid and retina. It causes detachment of the retina, and finally perforates it, enters the vitreous and sooner or later causes an irido-cyclitis, with inflammatory changes which end in destruction of the eye. It has a dumb-bell shape, is iridescent, and has a peristaltic motion. The treatment is to remove the cysticercus.

**Persistent Hyaloid Artery.**—The hyaloid artery is an extension from the central artery of the retina which in the embryo runs from the papilla to the lens and furnishes the nourishment of the lens. Obliteration of this artery is usually complete before the termination of foetal life, but sometimes it fails and some vestige of the artery remains. With the ophthalmoscope a somewhat tortuous cord may be seen, which may extend from the disc forward to the lens or merely as a rudimentary strand attached either to the disc or lens, and in some instances it has been seen to contain blood. This condition is often found associated with persistent pupillary membrane or other foetal abnormalities. The vision is often but slightly affected.

**Detachment of the Vitreous.**—The vitreous may become

detached from the retina by traumatism, or hæmorrhages, as a result of exudation in choroiditis and from intra-ocular growths. It is always of serious import from its tendency, by dragging upon the retina, to cause a detachment of that membrane. It is considered by some authorities to be a forerunner of nearly all detachments of the retina. Galezowski diagnosed detachment by a semicircular gray rim at the border of the optic disc, but there appears to be no constant signs by which it can be diagnosed with certainty.



## CHAPTER XXII.

## Diseases of the Crystalline Lens.

**Anatomy.**—The crystalline lens is a transparent, bi-convex, solid body that is inclosed in a transparent capsule and rests just behind the iris in a depression in the vitreous humor. The measurements of the lens at different periods of life were most carefully made by Priestley Smith,\* who examined one hundred and fifty-six lenses and found the diameters to vary from 8.25 mm. to 10 mm. The antero posterior diameter was not systematically measured, but he believes that the measurement of 3.7 mm. attributed to this axis of the lens in the schematic eye is too small even for the young adult, and that in elderly people he has found the axial thickness of the lens to be as high as 6.5 mm. His experiments also show that the healthy lens increases in weight and volume throughout the whole of life, adding from the twenty-fifth to the sixty-fifth year of life one-third to its weight, one-third to its volume and one-tenth to its diameters. Lenses which are becoming cataractous are as a rule smaller than healthy lenses. The lens in the young is perfectly colorless, but becomes yellowish later in life, at the same time it becomes flatter and less elastic. The shape of the lens is, therefore, more globular in early life, and, from its greater elasticity at this period, it has a greater amplitude of accommodation.

The substance of the lens is made up of long fibres or cells and an interstitial cementing substance. The fibres are band-like structures having an oval nucleus and are arranged in concentric lamellæ, each lamella consisting of a single layer of fibres. Each lens-fibre runs from the anterior to the posterior surface in a meridional direction, the ends meeting at the poles of the lens in such a manner as to form a stellate figure. The result of this arrangement is to divide the mass into sectors. The fibres toward the centre of the lens are more compressed than the peripheral

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\* Trans. Ophthal. Soc., vol. iii, 1883.

ones, and hence the centre of the lens is spoken of as the nucleus and the more peripheral portion as the cortex. The refractive index of the lamellæ increases from the periphery toward the centre. In the young the superficial fibres have about the same index of refraction as the aqueous; but, as the refracting power increases with age, the difference causes an abrupt change which creates a reflection of light from the surface of the lens in old people and causes the grayish or semi-opaque appearance of the pupil so frequently seen in the aged.

The capsule of the lens is a highly elastic homogeneous membrane, thicker in front than behind. The anterior capsule is lined with a single layer of transparent, hexagonal cells which are supposed to govern the nutrition of the lens. The posterior capsule has no epithelial lining, but is in close contact with both the substance of the lens and the vitreous.

The lens is held in position by the *zonule of Zinn* or suspensory ligament of the lens, which is a continuation of the *membrana limitans* of the retina. This membrane is firmly attached to the ciliary processes, and, as it passes to the border of the lens, divides into two layers, to be inserted into both the anterior and posterior capsule. The small space left by the separation of this membrane is called the canal of Petit and is supposed by some to convey the nourishment to the lens. The function of the zonule of Zinn is probably to maintain the lens *in situ* and to control its accommodative changes.

**Cataract.**—Opacity may occur in the lens or its capsule, or both.

**PATHOLOGY.**—The pathological changes in cataract have been especially studied in *senile* cataract. It commences by the separation of the lens-fibres at spots so that spaces containing fluid (spheres of Morgagni) are produced. These spaces are first formed between the nucleus and the cortex and are supposed to be due to sclerosis and shrinking of the nucleus. The liquid within the spaces, which is at first transparent, coagulates and becomes cloudy. The lens-fibres then become cloudy and contain in their interior minute drops of a fatty substance. The lens-fibres swell up in spots and finally break down, so that from the lens tissue there is formed a pultaceous mass composed of drops of fat, spheres

of Morgagni, remains of lens-fibres, and an albuminous liquid. As the lens-fibres break down liquid collects between the lens and capsule, loosening the intimate connection that normally exists.

The nucleus remains unchanged in the midst of the disintegrating cortex. There may later be a gradual resorption of the pulsataceous lens-masses resulting in some clearing up of the opacity.

*Capsular Cataract* is due to a deposit upon the inner surface of the capsule, between it and the lens, and results from a proliferation of the capsular epithelium. There is formed a multiple layer of these cells from which, by the growth of the epithelial into elongated fibres, there is formed a sort of fibrous tissue which causes a distinct elevation on the anterior surface of the lens.

In *Soft Cataract* the fibres are swollen and varicose; they become degenerated and destroyed. There is an increased amount of fluid, the fibres containing molecules, and *débris* of fat are thrown off between the fibres. The *Traumatic Cataract* is due to an injury, causing a rupture in the capsule, allowing the entrance of the aqueous, which causes a swelling and disintegration of the lens fibres. In *Diabetic Cataract* Kamocki\* describes the pathological changes in the lens as follows: Commencing with proliferation of the intra-capsular cells, together with the formation of vesicle cells, and, finally, the absorption of water by the lens nucleus, with resulting loosening of its fibres, and drops of water forming in the spaces made by the separation of its fibres.

SYMPTOMS.—There is at first the appearance of motes before the eye and a slowly progressing dimness of vision which causes some obscuration of distant objects and, from the swelling of the lens, the refraction of the eye increases so that the tendency is to cause myopia of a low degree. The opacity in the lens will also often produce astigmatism or alter an already existing irregularity. The extent of the loss of vision will depend upon the situation and extent of the opacity and will be different in different cases; some will be greatly affected by the presence of a few striæ, while in others we are often surprised at the acuity of vision that will be possessed by an eye in which the fundus will be almost obscured by the numerous striæ. As the lens becomes more and more opaque the acuity of vision is gradually reduced until only per-

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\* Archiv. Ophthal., vol. xvii., 1, 1888.

ception of light remains. Photophobia and phosphenes are sometimes complained of and in some cases pain and asthenopic symptoms will be experienced on attempting to use the eyes. There is occasionally from the strain on using the eyes slight conjunctival hyperæmia. In ripe cataract the pupil will appear gray or white in color, excepting in some cases of so-called "black cataract," when it will appear dark; the pupil may also be small and sluggish. The anterior chamber is sometimes a little shallow from swelling of the lens.

The use of the ophthalmoscope, together with the oblique illumination, renders the diagnosis of cataract not at all difficult. Dilation of the pupil either with homatropine or preferably cocaine renders the examination more thorough. With the oblique illumination the opacity, if immature, appears as white or gray streaks or dots. The ophthalmoscope is used by the direct method and with a weak illumination. The patient is then made to look in all directions so as to bring all parts of the periphery into view. The most frequently seen opacities in cataracts are in the form of streaks or spiculæ running from the periphery toward the centre of the lens, and which appear black with the ophthalmoscope. Particles may be seen in any part of the lens and the remainder of the lens be perfectly transparent. Thus the nucleus may be involved and the periphery clear, or the periphery may be affected all around or at one spot and the nucleus and balance of the lens remain clear. If the opacity involves the whole substance of the lens, there will be no reflex from the fundus. In some cases the undilated pupil will give no reflex, but, upon using some mydriatic, the periphery of the lens will give the reflex, showing that the cataract is still immature and that the extreme periphery has not become entirely opaque.

COURSE.—Simple senile cataract, as a rule, follows a progressively increasing course from incipency to full maturity; but, according to some authorities, an immature cataract may in some cases remain stationary for many years. The period of time required for the development of mature cataract from its incipency is most variable, as in some cases the cataract will progress rapidly and blindness ensue within a few months, while others will go on for several years before the cataract will become fully matured. Some idea of the rapidity of the progress may be formed in the



striated variety of the cataract from the appearance of the striæ, as the thin, narrow striæ are of much slower course than are the broad and thick striæ. Opacities occurring as dark, flocculent masses usually advance more rapidly than do those commencing as striæ. Opacities showing both the striæ of the cortex and the haziness of the nucleus as well, are spoken of as mixed cataracts and are usually more rapid in their progress. After reaching maturity the cataract may proceed to the condition of "over-ripeness or Morgagnian cataract, in which the cortical substance becomes liquified and the nucleus displaced. Other changes sometimes met with in over matured cataracts are calcareous and fatty degenerations of either the lens or its capsule. Spontaneous absorption may take place in diabetic cataracts, and has been reported as occurring in the ordinary senile cataract.

The course above described refers to the ordinary senile or hard cataract, occurring in individuals upward of thirty-five years of age. All cataracts occurring under this age are of the soft variety, the course of which will be referred to later under the different varieties.

CAUSES.—Senile cataract often occurs in its incipency in young people from twenty to thirty years of age, and for this reason the term *simplex* would be preferable to *senile*. Schoen\* says that "three-fourths of the total number of cataractous eyes are hypermetropic or astigmatic." The strain from uncorrected refractive errors, we believe, bears a very important part in the causation of cataract.

Sugar in the urine has been found in about one per cent. of cataract cases. The urine should, therefore, always be examined, and especially when cataract is met with in young persons. Albumin has also been found in the urine. Cataract has been seen in persons suffering from epilepsy and other convulsions, also after meningitis, cutaneous diseases, etc. It is also frequently found in those working in excessive heat and light, as in glass-blowers. Heredity appears to bear a very important relation to its occurrence, as examples of its transmission have frequently been reported.

In countries subject to epidemics of ergotism, cataract has been

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\* Archiv Ophthal., vol. xviii., 3, 1889.

frequently found associated with it. Animals poisoned with Naphthalin have developed cataract. Cataract is often secondary to inflammatory affections of the eye, especially of the iris, ciliary body and choroid, in glaucoma and detachment of the retina. Traumatism is also a frequent cause, and may be either from a direct injury of the lens or from concussion.

**Varieties of Cataract.**—The description already given may be considered as applying in a general way to all forms of cataract, the most typical type of which is the simple or senile cataract. The classification of cataracts met with in different works is most confusing, as by different authorities they will be classed according to their anatomical location, their consistency, their color, whether primary or secondary, partial or complete, senile or congenital, etc. The following table, taken from De Schweinitz,\* gives a *résumé* of the various classifications:

Anatomically	$\left\{ \begin{array}{l} 1. \text{ Lenticular.} \\ 2. \text{ Capsular.} \\ 3. \text{ Capsulo-lenticular.} \end{array} \right.$
Clinically . .	$\left\{ \begin{array}{l} 1. \text{ Senile } \left\{ \begin{array}{l} (a.) \text{ Cortical} \\ (b.) \text{ Nuclear} \end{array} \right\} \text{ General.} \\ 2. \text{ Juvenile or congenital } \left\{ \begin{array}{l} (a.) \text{ Complete } \left\{ \begin{array}{l} \text{Complete.} \\ \text{Congenital.} \end{array} \right. \\ (b.) \text{ Partial } \left\{ \begin{array}{l} \text{Lamellar, or zonular} \\ \text{Pyramidal, or polar.} \end{array} \right. \end{array} \right. \\ 3. \text{ Complicated or secondary } \left\{ \begin{array}{l} \text{Anterior polar cataract.} \\ \text{Posterior polar cataract.} \\ \text{Complete cataract.} \end{array} \right. \\ 4. \text{ Traumatic.} \\ 5. \text{ After cataract.} \end{array} \right.$

The clinical classifications are perhaps most frequently employed, and as the description already given applies to the first clinical sub-division, *i. e.*, senile cataract, we will refer briefly to some of the other varieties.

**Complete Congenital Cataract** involves all the layers of the lens and is a rare form of cataract, frequently accompanied by nystagmus. In this the lens is soft, densely opaque and either of a white or bluish-white color. There is also often an opacity of the capsule as well, and this form of cataract is apt, in course

\* Diseases of the Eye, 1892, p. 386.

of time, to undergo degeneration, becoming shriveled up, membranous or calcareous. There may be a dislocation of the lens from degenerative changes of the zonule of Zinn.

The cause of this variety of cataract has been variously attributed to heredity and disturbances of nutrition in intra-uterine life. The treatment before degenerative changes have set in is by discission. If, however, it has become calcareous or membranous, extraction should be made as in senile cataract.

**Cataracta Lamellaris** or **Cataracta Zonularis** is a congenital opacity involving only a portion of the lens, and, as its name implies, affects only one or more lamellæ between the nucleus and the cortex, forming an opaque layer surrounding the clear nucleus of the lens. Microscopical examination of this form of cataract has but rarely been made, and hence the description given by Beselin\* is of much value. He concludes, "that a chemical alteration in the subsequent nucleus, brought about by a change in the nutrition of the part, attending rhachitis, is the primary factor. This change is followed by a general contraction of the affected part, which causes the formation of fissures between this part and the normally developed, unaffected, cortical layers of lens substance. A granular deposit takes place in the tissue plasma collected in the fissures and at the same time the neighboring lens-fibres take on a form of granular degeneration. In the majority of cases lamellar cataract is present in both eyes, although it does occur in but one." It is supposed that the opaque layers are the outer layers of the lens during the period when the nutrition is disturbed by rachitis, later, after the disappearance of the rachitis, normal transparent lens substance is again deposited, forming the transparent external layers.

The vision is more or less affected, depending upon the density of the opacity and the amount of lens involved. The patients hold objects very close to the eyes and are commonly thought to be near-sighted, and true myopia may exist. With the ophthalmoscope there is seen a sharply defined opacity in the axis of the lens which is generally circular and more or less dense; the periphery of the lens is usually perfectly clear. The darkness of the opacity

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\* Archiv. Ophthal., vol. xvii., 3, 1888.

is greater near the edge than the center, and this aids in the diagnosis because a solid cataract with the nucleus involved would be densest at the centre. Occasionally opaque dentations are seen projecting into the transparent periphery from the margin of the opacity. Lamellar cataract usually affects both eyes. A history of convulsions, as pointed out by Arlt, is frequently found in these cases. In addition to rickets, scrofula or hereditary syphilis is often determinable as a constitutional cause and is frequently evidenced by an examination of the teeth, which appear irregular, notched and broken. Lamellar cataract, as a rule, remains stationary, though not invariably so.

*Treatment* of this form of cataract is usually by iridectomy, which should be made when, upon dilatation of the pupil, with the refractive error, if any, corrected, the vision is improved, as by displacing the pupil the transparent portion of the lens is used and clearer vision results. Dissection or removal of the lens may be made when the vision is less than one-third of the normal, when opaque spots extend into the transparent periphery beyond the layers involved indicating a tendency to form a complete cataract and when there seems no likelihood of improving the vision by an iridectomy.

**Cataracta Polaris Anterior** or **Cataracta Pyramidalis** may be simply a minute white dot upon the capsule of the lens, or a larger, dense, chalky-white, circular patch involving both the capsule and the substance of the lens for a short distance immediately beneath. It often seems to stand out in front in a pyramidal form. The condition is sometimes congenital, and, if so, usually in both eyes. In these cases it may be the result of imperfect closure of the capsule, or possibly from the remains of the pupillary membrane. More frequently, however, the opacity occurs after birth from a central perforating ulcer of the cornea, as in ophthalmia neonatorum; the lens is thrown forward in contact with the cornea upon escape of the aqueous, a plug of lymph is thrown out, closing up the perforation, and as the aqueous re-forms the lens is pressed back, carrying with it a little mass of lymph attached to its capsule. In these cases a central opacity of the cornea may frequently be seen by the oblique illumination. This form of cataract is always stationary.



**Cataracta Polaris Posterior** is the term applied to a glistening, white, round opacity of the posterior pole of the lens or its capsule. In its congenital form it is due to some remains or imperfect absorption of the hyaloid artery. When acquired it is usually the result of a disease of the choroid, vitreous or retina causing malnutrition of the lens. Opacities in the vitreous are usually determinable, and often lesions of the fundus may be discovered with the ophthalmoscope. The opacity is seen to move but very slightly upon movement of the eye because of its position at about the centre of rotation. The opacity in itself does not cause a very great loss of vision, but the patients see poorly on account of the lesions further back. This form of opacity may remain stationary for a long time, but in the end the lens usually grows more opaque.

**Cataracta Traumatica** is an opacity of the lens due to injury, and as a rule the whole substance of the lens becomes opaque. The traumatism may be a direct injury to the capsule of the lens, as in penetrating substances, which, by lacerating the capsule, permits the aqueous to come into contact with the substance of the lens, causing it to swell and become opaque. Absorption sometimes follows within a few weeks after the injury without other serious results, but in other cases the swelling of the lens will set up either glaucoma, iritis or cyclitis. A blow upon the eye may also cause an opacity of the lens by the force of the concussion, rupturing either the anterior or posterior capsule, and in some cases it may possibly occur without any rupture of the capsule. Cataract usually forms very rapidly within a few days, after the admission of aqueous to the lens substance and results from the action of the sodium chloride of the aqueous upon the globulin of the lens substance. The younger the patient the more rapid is the swelling and absorption and the danger of increased tension and inflammation is less. The older the patient the greater is the danger of glaucomatous symptoms. In an extensive rupture of the capsule some of the lens substance escapes into the anterior chamber where it swells up, breaks down and becomes absorbed. In some cases of slight laceration of the capsule there is formed a limited opacity, which may disappear, remain stationary or increase.

**Cataracta Secundaria**, or *after cataract*, as it is sometimes called, is the term applied to changes occurring in the capsule of the lens that remains after the extraction of the cataract. Secondary cataract may be either simple or complicated. In the majority of cases, after the extraction of the lens, the lacerated anterior capsule is thrown into folds and adheres to the posterior capsule, within these folds is shut up a small amount of lens substance which becomes opaque or there may be simply a proliferation or increased thickening of the capsule. This simple form may be either thick and opaque or thin and almost transparent. It may appear within a few days after the operation, or not for months, and is more apt to come on rapidly when peripheral opening of the capsule has been made. The complicated form of secondary opacity is a more serious affair, for in these cases there may be thickening and contraction, the iris, which is adherent to the capsule, is drawn up toward the wound and may wholly obliterate the pupil. Cyclitis, detachment of the retina and other changes may ensue, the vitreous becomes fluid and the eye passes into atrophy, and sometimes even sympathetic ophthalmia may result from the irritation.

Secondary cataract should never be operated upon until all signs of irritation of the eye have ceased. We believe that, as a rule, four weeks after the extraction is the earliest date that the operation for secondary cataract should be made, and that it would be better to wait as many months, or even a year in many cases. Generally, however, these patients are desirous of securing the use of the eyes again as soon as possible, so that usually the operation is made in from six weeks to three months after the extraction. We have seen a very thick, opaque secondary opacity gradually absorb so that after several months it became very thin and almost transparent. The operation for secondary cataract is discussed, described on page 444.

**Cataracta Capsularis** is the name sometimes used when there is an opacity of the capsule. It may be seen either congenitally or as secondary to some other inflammation of the eye, and there is generally a proliferation and thickening of the epithelium of the capsule. This form of cataract is more often placed under the heading of polar cataract, either anterior or posterior.

**DIAGNOSIS.**—The simple diagnosis as to the presence or not of

either a partial or complete cataract has been sufficiently shown under the symptoms already detailed. The importance, however, of a thorough examination of the cataract itself, together with a diagnosis as to whether complicated or not by other diseased conditions of the eye, is of the utmost value in forming an opinion as to the advisability of an operation and the prognosis as to the ultimate vision after an extraction. The size and density of the lens should be determined, the action of the pupil, whether adhered to the capsule, sluggish or freely movable, and the tension of the eye must be considered. The perception of light is the most important diagnostic point to determine both the acuity and the field of vision. In a mature, uncomplicated cataract the patient should be able to recognize the light of a candle in a dark room from thirty to forty feet away. The patient should also be able to recognize the direction from which the light comes, and the test should be made by holding the light in all parts of the field of vision. Any inability to recognize the light in the different directions would at once cause a suspicion of some intra-ocular lesion, which, of course, renders the prognosis less favorable. The examination as to the light perception may be made by the ophthalmoscopic mirror held from three to five feet away and using a weak illumination. A decided limitation in the field might indicate detachment of the retina, atrophy of the choroid, or other lesions of the nerve, retina or vitreous. The tension of the eye should be noted, as cataract may occur with glaucoma, when it would be increased, or with an inflammation of the ciliary body or choroid, when we would have a diminished tension with possibly a discoloration of the iris and tenderness of the ciliary region. Fluidity of the vitreous would be indicated by tremulousness of the iris and lens. This might also occur from a relaxation or loosening of the suspensory ligament. The lens itself, if shriveled or flattened, or if of a chalky-white or calcareous appearance, would indicate some serious intra-ocular changes.

Operative procedures are not necessarily contra-indicated by the existence of any of these conditions, still it is important to recognize the complication in order that the probable results may be correctly appreciated by both the surgeon and the patient. The diagnosis as to whether the cataract is mature or not is also of importance, as in immature cataract, where there is not complete opacity

of the cortex of the lens, more or less of its cortical substance may remain after escape of the nucleus and cause trouble. The usual test is by the oblique illumination, which, when the cataract is immature, shows a shadow upon the lens on the side from which the light comes. This is the shadow of the iris and is due to the fact that the opaque lens is posterior to the plane of the pupil and that there is a clear space between the iris and the opacity. When the cataract is ripe the opacity is level with the margin of the pupil and there is no shadow formed. In hypermature cataract the shadow is present, but a careful examination may show the yellow nucleus of the lens sunken out of the axis of the eye and its rim may be seen in the pupil and may change its position as the head is inclined from one side to the other. We must avoid mistaking the black rim at the pupillary border of the iris, due to a projection of its posterior pigment layer, for the shadow. In certain cases of so-called amber lenses the nucleus of the lens, instead of appearing of the usual grayish-white color, assumes an amber-like translucency, and in these cases there may be a slight iris shadow together with a certain reddish reflex from the fundus with the ophthalmoscope, while the cataract is really matured as much as it ever will be. No red reflex from the fundus is to be seen with the ophthalmoscope in any other variety of cataract when matured. The appearance of the surface of the lens gives some information, for when the striæ appear very fine the lens is hard, while, if broad and white, the cortex is more or less soft.

PROGNOSIS.—In the immature senile cataracts, particularly where the opacity is in the form of peripheral striæ, I believe, if they are taken in the earlier stages, that the tendency to progress to complete opacity *can be checked* by homœopathic treatment in the majority of cases. In my report of "The Homœopathic Treatment of Incipient Senile Cataract, with Tabulated Results of One Hundred Cases"\* this claim of the value of homœopathic remedies to check the progress of incipient cataract was borne out by the fact that one-half of all the cases under observation for two years or over showed no failure in the vision and no increase of the opacity, and that in about one-third more there had been but a very slight loss of vision. Further that in those cases where

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\* No. Amer. Jour. of Homœo., Dec., 1891.



the vision was better than  $\frac{1}{50}$  at the commencement of the treatment, there was no increase of the cataract in 60 per cent. of the cases; but that in those cases where the vision was not better than  $\frac{1}{50}$  the growth of the cataract seemed checked in but 45 per cent. of the cases treated. Therefore, I believe we are warranted in holding out to patients with incipient senile cataract a probability of preserving their sight unimpaired, instead of dooming them to a long period of gradually increasing blindness, with the prospects of an operation at the end. Rare instances of the spontaneous disappearance of cataract by absorption have been reported. The usual course, however, of cataract, when once started, is a steadily increasing opacity of the lens until complete blindness has ensued. For matured cataracts nothing but operative procedures are to be considered, and, when uncomplicated, the results are usually good. Unfavorable conditions in these are when the patient is very greatly debilitated, in very fat subjects, or when there is a bad cough. Other conditions which would militate against the prompt healing of the wound are of course unfavorable and should be relieved, if possible, before the operation is undertaken. The most formidable of these are catarrh of the lachrymal sac, chronic conjunctivitis and pterygium, all of which should be corrected, if possible. Careful prophylaxis is always an essential feature in the prognosis and should be followed out thoroughly. The results of cataract operations are usually good. Statistics have been compiled which will show the average per cent. of failures of numerous operators, taken collectively, to be only from 5 to 10 per cent.; but, for individual operators of an extended experience, the per cent. has been much lower.

A vision of  $\frac{1}{10}$  has been called fully successful, and when but mere perception of light and worse, failures. This standard, under recent years experience with asepsis, should, we think, be lowered to that adopted by some, of  $\frac{1}{6}$  in order to be called successful.

**TREATMENT.**—A large number of cases are to be found in our literature in which the internal administration of a few doses of the properly selected remedy has worked a wonderful cure of cataract, but the great majority of these must be taken "cum grano salis," and put aside with the remark, "mistaken diagnosis."

After years of experience in the treatment of cataract, I have no doubt that a careful selection of drugs, according to the homœopathic law, and their continuance for a long period, will succeed in a large proportion of cases in checking the progress of the disease and in many cases clear up a portion of the diffuse haziness, thus improving vision to a certain extent. *But after degeneration of the lens-fibres has taken place, no remedy will be found of avail in restoring its lost transparency and improving the sight.* We must then, providing the vision is seriously impaired, resort to operative measures.

The medical treatment will consist of the selection of remedies, according to the constitutional symptoms observed in the patient, for the objective indications are entirely or nearly absent. We cannot yet decide from the appearance of an opaque lens what remedy is required.

The following drugs have been found most efficacious in arresting the progress of cataract:

The accurate correction of all refractive and muscular errors is, in my opinion, a very important factor, which is too frequently neglected, in checking the progress of immature cataract.

**Causticum.**—Of all the remedies used, *Causticum* has undoubtedly proven of the most value in my hands. The principal indications for *Causticum* seem to be a feeling as if there was sand in the eyes, sensation of pressure in the eyes, heaviness of the lids, burning, itching of the eyes, with desire to keep them closed, photophobia, flashes of light before the eyes, winking and twitching of the lids.

**Iodoform.**—Dr. William R. King, of Washington, D. C., reports in the *Journal of Ophthalmology, Otology and Laryngology* for April, 1891, six cases of incipient cataract very much benefited by the use of this drug. In the last seven years I have used this remedy quite extensively, in all forms of senile cataract, with decidedly good results. It seems to me especially useful in those cases of broad striæ or patches of flocculent masses in the cortex of the lens indicative of a rapidly progressing cataract.

**Sepia.**—Eyes feel weak, worse toward evening and better in the middle of the day; some sharp pains in the eyes, heaviness of the lids, twitching of the lids, smarting of the eyes, relieved by eating; *headaches which are worse morning and evening*; perspires

very freely, worse morning and evening. The morning and evening aggravation seems to be characteristic of Sepia, and it is a useful remedy in the cataracts of women.

**Phosphorus** has proven of value in some cases of cataract. The especial indication of the eyes seems to be the *colors before vision*, black floating spots before the eyes, flashes of light and the concomitant symptoms of the drug.

**Calcareo phos.**—In checking the progress of cataract it has appeared to be of decided service and will be of value when the following symptoms are present: Headaches, especially of the right side, pain around the right eye, aching pain in the right eye, tired feeling of the right eye. These have all been relieved by *Calc. phos.* Other symptoms noted were: Eyes feel stiff and weak, dizziness, rheumatic pains, etc.

**Naphthaline** is a remedy I have used, simply because it was found to have produced cataract in the eyes of animals, but my success with this drug has been very indifferent.

Other remedies that may be called for are Argent. nit., Calc. carb., Chin. ars., Con., Ignat., Kali iod., Kali mur., Lach., Lyco., Magn. carb., Natr. mur., Nitric ac., Nux vom., Puls., Senega, Silicea and Sulph.

**Galvanism** I have employed in a great many cases, but always together with remedies. The cases in which it has been used have shown no more favorable results than those treated with remedies alone, so am undecided whether it has any value or not.

**Massage** of the eye in incipient cataract has been credited with surprising results by some. I have employed it in some cases, but with no apparent benefit.

In addition to the remedial treatment just referred to for immature cataract the refraction should be carefully examined and the glass which gives the best vision prescribed.

**Operative Treatment of Cataract.**—*Iridectomy* may be performed in the usual manner, as already described, on page 305, for three purposes: First, in order to secure an artificial pupil in front of some transparent portion of the lens in central, stationary forms of cataract, as in lamellar and partial congenital cataracts when central. Iridectomy is indicated in these cases when, after dilatation of the pupil, there is sufficient improvement in the vision

to warrant the slight disfigurement of a new pupil. It should be made in front of the clearest portion of the lens and preferably downward and inward. Iridectomy may also be of service in some cases of polar cataract, but, as this variety will sometimes increase, the beneficial results are not as liable to be permanent.

As a second indication for iridectomy, it may be made for the purpose of producing artificial ripening of an immature senile cataract, according to the method suggested by Förster\* which is by making an upward iridectomy and then bruising the lens-fibres by rubbing the cornea either through the lids or by a horn spoon directly upon the cornea. Some operators insert a spatula into the anterior chamber and press directly upon the lens. This method, artificial ripening, is indicated in those cases in which the opacity has reached the stage where the blindness is sufficient to incapacitate one for their customary occupation and the progress of the cataract still indicates a long period before maturity when extraction is justifiable. In some cases complete maturity of the opacity will result in from two to four weeks when extraction may be made. Others will mature more slowly, and, in some cases, we have seen no effect whatever from the operation. Only gentle rubbing of the cornea is required, and no bad results have ever occurred in our hands from the procedure. In some cases we have followed this method in one eye, when there was an equal opacity in both, with subsequent extraction and good vision in the operated eye, while the other would be watched for several years before the cataract would become matured and extraction be warranted. Thus, instead of waiting for the cataract to become ripe and ready for extraction, several years of useful vision may be given the patient in those cases where the cataract is almost matured in both eyes.

The third use of an iridectomy is as a preliminary operation to the extraction or at the same time as the extraction. Up to within the last eight or ten years my invariable practice was, when the patient would submit to two operations, to make a preliminary iridectomy, believing it to be by far the safest method of extraction, more certain to insure success than any other method, and with less danger of after inflammation. My more recent

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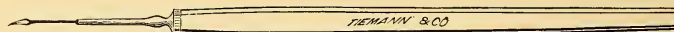
\* Archiv. Ophthal., xi., pt. iii., p. 349.



method, in uncomplicated cases, is to extract without an iridectomy, and this is undoubtedly the ideal operation in suitable cases. When an iridectomy is made, it is more frequently done at the time of the extraction. The following indications for iridectomy are recommended by Galezowski:\* (1) Where the iris falls before the knife; (2) in synechiæ; (3) when the corneal wound is too small; (4) in capsular cataract; (5) in subluxation of the lens; (6) in constitutional cataract (glycosuria, albuminuria); (7) in syphilis.

*Discission, or needle operation*, is applicable to all forms of complete cataract in children, viz.: Congenital or traumatic cataracts. The object of this operation is to open the capsule of the lens, and, by allowing the entrance of the aqueous to the lens substance, cause its absorption. The value of this operation is especially in children under fifteen years of age, and may be used up to the twenty-fifth year, but after that age absorption takes place very slowly, if at all. The operation may be made in con-

FIG. 79.



Bowman's stop needle.

genital cataract as early as the third month, but it is just as well to wait until the child is a year old. In very early life one slight puncture is often sufficient to cause complete absorption, although in later years it will usually have to be repeated several times at intervals of two or three months. The dangers to be apprehended from discission are glaucoma from too rapid and excessive swelling of the lens substance and iritis from pressure of the swelling masses upon the iris.

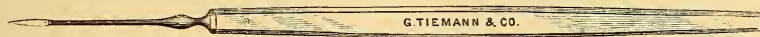
The method of discission is, after dilatation with atropia, to produce general anæsthesia in young children, or the use of cocaine in older subjects. The lids, separated by the speculum, and the eye steadied by fixation forceps, the needle (Fig. 79) or knife needle (Fig. 80) is now entered through the cornea at the temporal side, and, reaching to the opposite side of the pupil, the needle penetrates the capsule, when, by using the cornea as a fulcrum it is made to cut the capsule (Fig. 81). A second cut may be made at right angles to the first, although at the first operation it

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\* Soc. d'Opht. de Paris, July 2, 1889.

is better not to make too extensive laceration of the capsule, for fear of too much swelling of the lens, causing damaging pressure upon the iris or ciliary body. More extensive cutting of the capsule may be made at subsequent operations. Sometimes two

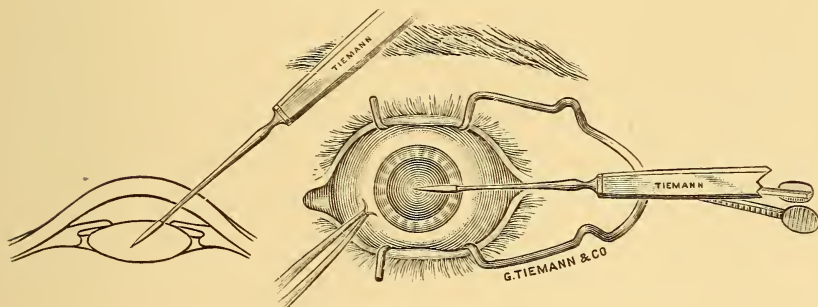
FIG. 80.



Knapp's scalpel needle.

needles may be used, entering them at opposite sides of the cornea and penetrating the lens at the centre of the pupil, then, by inclining the handles toward each other, the points separate and an opening is at once made. Stop needles, which prevent a

FIG. 81.



The needle operation.

too deep entrance of the needle, are made for this purpose.

After the operation atropia should be instilled and the eye bandaged. The patient is usually kept in bed for one day, when he is allowed to get up and the bandages removed. The pupil should be kept well dilated until absorption has ceased. In young children there is usually but very little, if any, reaction; but the older the subject the greater is the liability to swelling and inflammatory reaction. Sometimes the lens begins to swell rapidly within a few hours, fragments of the lens substance push forward into the anterior chamber, and there will be associated with it much pain and pericorneal injection. Ice compresses should be

immediately applied, atropia instilled and Aconite given. If not controlled within a short time and the aqueous becomes hazy, iris discolored and chemosis sets in, a large paracentesis should be made to allow of the escape of the aqueous and some of the lens substance, if possible.

Discission is also made for the opacity of the capsule following extraction, and for this purpose the knife needle is always preferable. The operation is the same as just described, excepting that in secondary cataract the object is to secure by a clean cut the curling away of the divided membrane in such a manner as to give a clear pupil, and for this purpose various shaped discissions have been recommended and practiced.

The shape of the discissions most generally made are +, T and >. Knapp,\* in a paper on "Glaucoma After Discission of Secondary Cataract," says that the first or + shaped discission gives the truly ideal results, *i. e.*, clear pupils, and is made by making at first a horizontal incision, then, by cutting from above down to the horizontal section and from below upward in the same way. But, owing to the occurrence of glaucoma in about 1 per cent. of his cases during the last six years, he has returned to the T-shaped discission. Care should be taken not to enter the knife any deeper into the vitreous than is necessary for a sufficient opening in the capsule. In some rare cases the use of the two needles as described may be preferable to the knife.

We believe that discission should be practiced in a large majority of cases of cataract extraction, as by so doing a greater improvement of vision can be gained. Disastrous results have been reported from discission, but so far we have been fortunate enough not to meet them, and hence do not consider our cataract operations completed until a perfectly clear pupil has been secured by discission. The operation should never be made until all signs of irritation of the eye, after the extraction, has passed away. The knife must be very sharp, and all rough handling or dragging upon the resisting bands must be avoided.

*Cataract Extraction.*—The various methods for the extraction of a cataractous lens that have been employed by different operators would, if described in detail, form a volume in them-

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\* Archiv. Ophthalm., vol. xxi., 2, 1892.

selves. In fact, it may be said that no two operators follow precisely the same method in every detail. The experience and *technique* of one will vary from that of another, and, in consequence, the procedure of one varies in some details from that of the other. On account of this variance, many so-called modifications are being constantly brought forward. There are, however, two essentially different methods of extraction which will be considered, viz.: Extraction with an iridectomy, and extraction without an iridectomy, or, as it is frequently called, the simple operation.

Previous to all cataract operations are certain preliminary considerations worthy of attention. As to the season of the year, it should depend upon the location, simply avoiding, if possible, extreme cold or heat. Age has less influence upon success than the general condition of the patient. Any chronic disease, such as nephritis or diabetes, that will impair the vital forces will tend to influence unfavorably recovery from the operation. A severe cough, asthma, incontinence of urine, or any condition affecting the general health, should be controlled as far as possible. All sources of infection, such as suppurating wounds, erysipelas, catarrh of the lachrymal sac, conjunctivitis, etc., must be provided against.

Thorough antiseptic measures should be strictly followed out. The room and bedding should be perfectly clean and free from all sources of impurity; the patient should have the face, hair, beard and hands thoroughly scrubbed with soap and water once or twice before the operation. The surgeon and the assistant should have their hands scrubbed with soap and water and the nails carefully cleansed and then again washed in a solution of mercury or carbolic acid. The instruments are thoroughly cleansed either in a solution of bichloride of mercury, 1 to 2,000, or in carbolic acid, 1 to 200, with the exception of the knife, which is immersed in a solution of boracic acid, or for a few minutes in boiling water. The face of the patient is then washed with one of the above solutions, taking great care to cleanse the margin of the lids at the root of the ciliæ. The conjunctival sac, especially if it contains any secretion, should be flooded with a 1 to 8,000 solution of the bichloride of mercury. General anæsthesia is not employed unless the patient is particularly nervous and unmanageable, when



ether is administered. A 2 or 4 per cent. solution of cocaine is dropped upon the cornea two or three times, at intervals of about ten minutes, when local anæsthesia is complete.

*Extraction with Iridectomy.*—This operation as most generally performed is practically that introduced by von Graefe as his modified linear operation, the slight variations or so-called modifica-

FIG. 82.

FIG. 83.

FIG. 84.

FIG. 85.

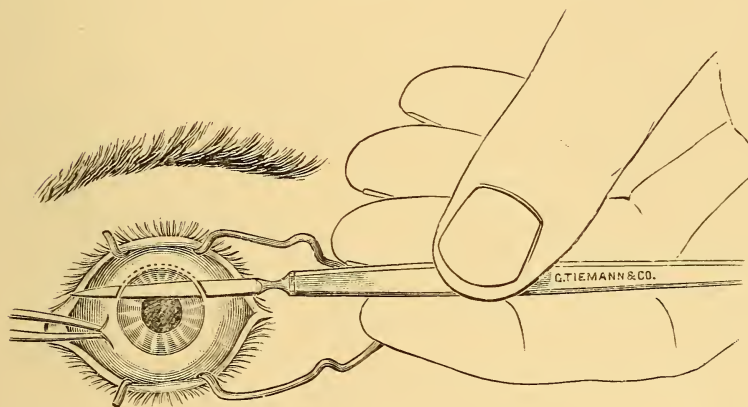
FIG. 86.

Graefe's  
linear knife.Norton's  
cataract knife.Knapp's  
cystotome.Hard rubber  
lens spoon.Fenestrated  
lens spoon.

tions being merely a slight variance in the position of the incision. Anæsthesia being complete, the speculum is inserted and the globe steadied with the fixation forceps. The knife is then entered by making the puncture at the corneo-scleral margin at a point on a level with a semi-dilated pupil. The direction of the knife when making the puncture is toward the centre of the pupil, and, when

well in the anterior chamber, is gradually, while being pushed across the chamber, brought parallel to the horizontal diameter until its point comes directly on a level with the puncture. The counter-puncture is now made and the knife cut out so that the whole section is about in the corneo-scleral margin. (See Fig. 87.) This first stage of the operation varies, as already referred to, with different operators merely as to the position of the puncture, counter-puncture and the completion of the section above, some making it further in the cornea and others deeper in the sclera, and some making a conjunctival flap above. In making the counter-

FIG. 87.



Cataract extraction—The incision.

puncture the point may catch in a wrong position, when it may be slightly withdrawn and entered again, care being taken not to increase the size of the opening at the point of puncture and allow of the escape of the aqueous. In cutting out, the iris may fold over the knife, when one of two procedures should be followed—either slowly withdraw the knife and postpone the operation, or preferably complete the section, cutting through the iris, which does not materially interfere with the success of the operation, except by the bleeding in the anterior chamber.

After the completion of the section, the iris, if not previously removed, is seized at its pupillary border with the iris forceps and

gently drawn out. As but a small iridectomy is necessary, no undue traction should be made upon the iris. The iris should be severed by one cut of the scissors, and, if its edges become caught in the wound, it may be made to free itself by gentle friction with the lid, or be replaced with the spatula.

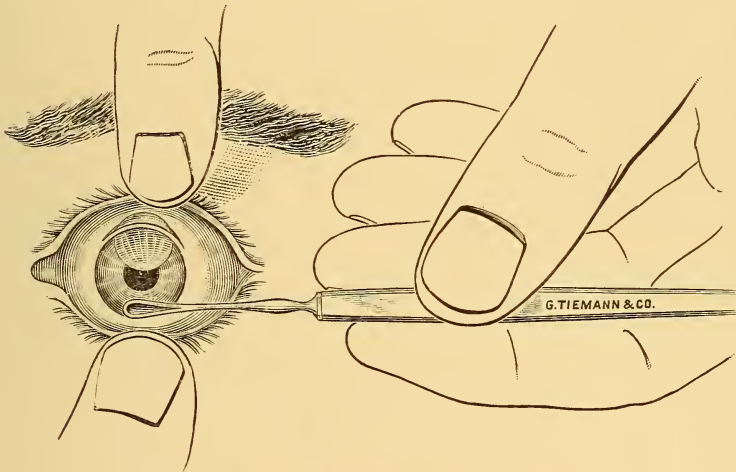
The cystotome is then introduced into the anterior chamber, the back of the instrument preceding and its cutting point held parallel to the surface of the lens; it is now pushed downward to the lower margin of the pupil or even beneath the iris, and the point turned toward the lens, the capsule of which it readily pierces. The division of the capsule is usually made by drawing the cystotome from the lower border directly upward, making a vertical incision through the capsule, and then a horizontal incision crossing it above, making a T-shaped opening. My method has been that practiced by Knapp, making a peripheral cystotomy. The larger the opening in the capsule the easier the lens is removed.

The final step in the operation is the removal of the lens, and for this purpose it is my preference to remove the speculum, holding the upper lid with the index finger of the left hand while the assistant draws down the lower lid; (See Fig. 88), but most authorities recommend leaving the speculum *in situ*. Pressure is then made with a scoop upon the lower border of the cornea, directing the force backward, not upward, until the upper edge of the lens, having been tilted forward, engages in the wound; the direction of the force should now be slightly upward as well as backward, following the lens as it passes out. The cortical substance is usually more easily removed directly following the nucleus than after waiting for the anterior chamber to fill, and the effort should be made to remove as much of the cortical substance as possible by gentle manipulation of the cornea with the scoop gradually coaxing it out. A too prolonged attempt in this direction, however, must not be made, as it tends to increase the danger of inflammatory reaction, and a clear pupil can be obtained later by discission.

After removal of the lens great care should be taken to thoroughly cleanse the wound from any cortical substance, shred of capsule, or prolapse of the iris. This is done with a hard rubber spud or spoon, dropping a solution of boracic acid upon the eye at the same time. The conjunctival sac is then thoroughly

cleansed by irrigating with a solution of boracic acid, all shreds or blood-clots removed, and the dressing is then applied. Many forms of dressing have been used by different operators from the simple application of strips of isinglass plaster to very elaborate bandages. My plan has been to apply to the closed eyes a piece of antiseptic gauze. The hollow at the inner canthus is then filled up with borated absorbent cotton, and over this another light layer of the cotton; the whole is then held in place by two strips of one-half inch adhesive plaster. These plasters are to run from the cheek to the brow, one over the inner the other the outer can-

FIG. 88.



Cataract extraction—The removal of the lens.

thus, care being taken that there be no pressure made upon the eyeball. This dressing when carefully applied makes no pressure upon the eye, and, while light and comfortable, supports the eye by keeping the lids closed and at rest. It is far more comfortable than the bandage and is easily raised for examination and dressing of the eye.

**AFTER-TREATMENT.**—The patient is placed in bed in a slightly darkened room and directed to lie as quietly as possible, turning from the back to the unoperated side as he desires. We believe it best that the patient be not allowed to sit up to eat, or, as a rule,



permitted to get up to urinate; but that rest in the prone position be followed for the first two or three days, unless the patient becomes very nervous and restless, when more liberty may be allowed. After this time he may be permitted to sit up and gradually allowed to do more and more each day. The dressing should not be removed for the first twenty-four or hours, if it has not become disarranged, or the patient has not complained of pain or discomfort of the eye. It is my custom to open the eye twenty-four hours after the operation, especially in the simple extraction, sufficiently to see if the anterior chamber is re-established and the iris in place. At the end of the second or third day, if there has been no trouble, the eye may be more thoroughly examined for the first time. The covering of the unoperated eye may be removed at the end of the third or fourth day. Normally the patient will have some smarting and often pain in the eye for the first four or five hours after the operation. The application of the ice-bag to the side of the head, or raising the dressing enough to draw down the lower lid and let out a tear, will usually relieve the pain. It is the routine practice of the majority of operators to instil a drop of atropine every day after the first forty-eight hours; this seems hardly necessary unless there are indications of iritis present. The covering of the eye, as a rule, can be removed about the sixth day and the eye protected for a few days longer with a light shield or smoked glasses. The eye is gradually accustomed to more and more light and the patient allowed to go out from the tenth to the fourteenth day.

*Accidents* during the operation are apt to be met with. One in which the iris falls before the knife during the incision has already been referred to. Another unfortunate accident is, when the incision is too small to permit of the escape of the lens, as too great pressure at this time to expel the lens may cause rupture of the zonula and prolapse of the vitreous may ensue. When this occurs, the incision should be enlarged with the blunt-pointed scissors. Dislocation of the lens, either partial or complete, has occurred from too great pressure with the cystotome. If it is pushed back into the vitreous it should be removed with the scoop or wire loop.

Escape of the vitreous may occur either before or after the extraction of the lens. If it occurs before the lens has become en-

gaged in the external wound, further pressure on the cornea must be at once abandoned, as it will cause additional loss of vitreous without resulting in the escape of the lens. The lens will then have to be removed with the scoop or wire loop, which is gently inserted well behind the lens, care being taken not to cause greater dislocation, and, by gentle pressure forward to prevent its slipping off, is gradually drawn out. When the loss of vitreous has occurred after the escape of the lens, the eye should be at once closed, a bandage applied, the patient put to bed with an ice-bag to the eye and Aconite given. Loss of vitreous, while a frequent and undesirable accident, is not necessarily serious, as good visual results are often obtained even after a large loss. Kerschbaumer\* reports the loss of vitreous thirteen times out of two hundred cases operated upon, and in no instance did loss of the eye occur.

In some cases the division of the capsule is not of sufficient extent to allow of the shelling out of the lens, and when this occurs the cystotome must be again inserted and a larger laceration made.

The absence of an anterior chamber is often noticed at the first dressings, but it should occasion no alarm if the wound is clear, as it is often not restored for a number of days.

Of the evil results that may occur after the operation severe pain is usually the forerunner, and may set in within a few hours or several days after a perfectly smooth operation and may indicate an intra-ocular hæmorrhage, suppuration of the wound or iritis.

*Intra-ocular Hæmorrhage* is the most serious accident that occurs at the time of an extraction, and, as a rule, results in panophthalmitis and loss of the eye. It is fortunately of extremely rare occurrence, as shown by the fact that, in the extended experience of Dr. Knapp, but one case had been seen by him up to November, 1890, which he reports in the *Archives of Ophthalmology*, January, 1891. In this case the eye was saved by carefully removing the blood, washing the conjunctival sac with a mild antiseptic, sterilizing the outside of the lids and applying an antiseptic dressing, which should be changed once or twice daily, according to the discomfort and discharge. If panophthalmitis supervenes, the eye should be enucleated at once.

*Suppuration of the Cornea*, since the general practice of anti-

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\*Archiv. Ophthal., vol. xx., 3, 1891.

sepsis in ophthalmic surgery, has, fortunately, become of quite infrequent occurrence. It results from some infection of the wound, either introduced at the time of the operation or within the first few days following, from some lachrymal or conjunctival discharge, and in some cases occurs in the very old or debilitated patients from want of sufficient nutrition in the cornea. It occurs usually within the first three days, though may occur as late as two weeks after the operation. The onset of suppuration is usually ushered in with severe pain, and, upon examining the eye, we find the lids swollen and puffy, the conjunctiva chemosed, the cornea hazy and sloughing at the margins of the wound. The suppurative process may be checked and the wound healed without any damaging results, or it may result in slough of the cornea with leucoma, or extend into a general panophthalmitis. The treatment is practically the same as described under ulcerations of the cornea.

*Iritis* following cataract extraction generally makes its appearance about the eighth day, sometimes earlier or later, and should receive the usual treatment for this condition.

To prevent as well as to arrest the progress of any form of inflammation in its initial stage occurring soon after cataract extraction, no local remedy is equal to the use of ice. Internal medication is also of decided value in the treatment of the various complications which arise after cataract extraction. For the neuralgic pains, which often occur within the first twenty-four hours, relief can often be obtained from five-drop doses of the tincture of *Allium cepa*, as first recommended by Dr. Liebold. Morphine in rare cases may be of service to relieve this pain. In any inflammation of the eye following cataract extraction, *Rhus tox.* is a most valuable remedy, and is given as soon as the patient begins to complain of pain, accompanied by lachrymation and puffiness of the lids. After pus has formed, *Hepar*, *Silicea*, or *Calc. hypophos.*, either alone or in alternation with *Rhus*, are of value. In some cases a low form of chronic conjunctivitis follows for awhile after the operation, and one of the best things for this condition is to keep the patient out in the open air.

*Extraction Without Iridectomy.*—Simple extraction, as this is usually called, is practically the same as the operation already described, with the exception of removing a section of the iris. All

the preliminary precautions should be followed out in this as in any other operation, with the exception of the Atropia dilatation. The corneal incision varies somewhat, in that it is made wholly in the clear cornea in simple extraction and should involve about the upper two-fifths of the circumference of the cornea. The object of the making a more central incision in this operation is to avoid the greater tendency to incarceration and prolapse of the iris from a too peripheral incision. A free division of the capsule should be made by inserting the cystotome as before and carrying it well under the margin of the iris. The speculum may then be removed and the upper lid drawn back with the forefinger of the left hand, which at the same time may make slight pressure on the upper part of the globe. The spoon is now applied to the lower part of the cornea and pressure made directly backward until the lens is tilted upon its axis and presents at the opening, when the pressure should be upward and backward, which causes an extrusion of the lens with more or less prolapse of the iris. A gentle pressure and stroking of the cornea with the spoon below, together with pressure above to open the wound, will promote the escape of the cortical substance remaining. This may be aided by irrigating the lips of the wound and the conjunctival sac with a warm, saturated solution of boracic acid, many operators recommending the irrigation of the anterior chamber at the same time. The prolapsed portion of the iris, if it has not already returned to its place, can be made to do so by gently stroking and pushing it within the lips of the wound with a smooth probe or spatula. On replacing the iris it should return to a central position and assume its circular shape; if it should not, gentle massage through the closed lid will often cause it to do so. Before applying the dressing, as already detailed, the eye should be thoroughly irrigated with the boracic acid solution and a few drops of Eserine solution may be instilled.

In the use of Eserine, Bull\* cautions against the instillations of a strong solution of Eserine, believing that it is apt to cause iritis, and claiming that half a grain to the ounce solution, or, in some cases, even one-tenth of a grain, is sufficient to produce any desired contraction. After forty-eight hours a solution of Atropia may

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\*Trans. Amer. Ophthal. Soc., 1890, p. 578.



be instilled to prevent posterior synechiæ, which are apt to follow; in other respects the after-treatment in uncomplicated cases is the same as in extraction with iridectomy.

The accidents and complications liable to occur in this operation are the same as those already referred to, with the addition of prolapse of the iris, which may occur at the time of the operation or immediately afterward, before closure of the wound, and in some cases by the reopening of the wound after having partially healed. When it occurs soon after the operation and cannot be returned to its place, it should be cut off. Prolapse may also occur later, and when it does is almost always of traumatic origin, due to some sudden movement of the patient, from coughing, lying on the operated side, from a too early examination of the eye, etc.; and when occurring later, after the wound is partially healed, it should be left undisturbed, as they generally heal with a cystoid cicatrix which in course of time flattens down, and although it causes some upward distortion of the pupil the ultimate vision may still be good. In some cases of a very large prolapse the bulging may be reduced by simply pricking, allow the aqueous to escape and apply a compress bandage.

Incarceration of the iris or anterior synechiæ is an adhesion of the iris in the lips of the wound without being prolapsed through it. This accident causes considerable distortion of the pupil and may be the source of irritation to the eye. Its occurrence, however, is, we believe, becoming less and less frequent, owing to a more general adoption of the more central corneal incision.

As previously stated, we believe the extraction without an iridectomy to be the ideal method of removing cataractous lenses; but, as it has its advantages and disadvantages, we quote from Bull (*loc. cit.*) a comparison of the same with the operation of extraction with iridectomy:

“1. If successful and without complication, it preserves the natural appearance of the eye—a central, circular and movable pupil.

“2. The acuteness of vision, with the astigmatism carefully corrected, is somewhat greater than after the old operation.

“3. Eccentric vision and orientation are decidedly better than by the old operation.

“4. Small particles of capsule are much less likely to be in-

carcerated in the wound, and thus act as foreign bodies and excite irritation.

“ 5. It is a shorter operation in point of time, by reason of the absence of an iridectomy.

“ 6. As there is no iridectomy, there is little or no hæmorrhage, and this may be considered a very decided advantage.

“ The disadvantages of simple extraction are as follows:

“ 1. The technique of the operation is decidedly more difficult than that of the old operation. The corneal section must be larger, in order that the passage of the lens through it may be facilitated, as the presence of the iris acts as an obstacle to its exit. The section must be performed rapidly, so as to avoid the danger of the iris falling on the knife and being wounded. This rapid passage of the knife across the anterior chamber renders it difficult to make the height of the flap an even curve, particularly when the incision is entirely in the clear cornea, as it should be. The cleansing of the pupillary space and the posterior chamber is much more difficult than after the old operation.

“ 2. Posterior synechiæ, secondary prolapse and incarceration of the iris are more frequently met with than after the old operation. The two latter may be largely avoided by making the corneal section, as before stated, in the clear cornea and not in the limbus, which is too peripheral and rather favors both prolapse and incarceration of the iris.

“ 3. The operation is not applicable to all cases. This objection, however, may be applied to all operations.”

**Aphakia.**—Absence of the lens is recognized by greater depth of the anterior chamber; a peculiarly black pupil and often tremulousness of the iris is present. Dilatation of the pupil will often show traces of the opaque capsule left behind. The power of accommodation is also lost. Removal of the lens in an emmetropic eye will leave a high degree of hypermetropia equal to about 11 D., and, of course, much less in a previously myopic eye. For near vision, as reading, writing, etc., a still stronger convex lens must be used. In addition to the hypermetropia, after the extraction of the lens, there is usually a certain amount of astigmatism, varying from 1 D. to 4 D., which is more often “contrary to the rule” and which should be corrected, together with the

hypermetropia. Glasses, as a rule, should never be prescribed until all signs of irritation of the eye have passed away, and are not often worn constantly at first with comfort. It is usually best to wait one or two months, at least after the operation, before prescribing permanent glasses.

**Luxatio Lentis** (*Ectopia Lentis*, *Dislocation of the Lens*).—This condition may be either partial or complete, and may be congenital (*ectopia lentis*) or from disease of the eye and from traumatism. The lens may be tilted obliquely, in the vertical plane or in any direction. It may be displaced backward into the vitreous or forward into the anterior chamber, and, from injury of the sclera, it may become lodged under the conjunctiva or entirely escape from the eye. Dislocation most often follows some disease where the vitreous has become fluid and the suspensory ligament, stretched and atrophied, gives way. High degrees of myopia favor this displacement, and when but partial, the border of the lens being in the pupil, there will exist two different states of refraction in the same eye, and we then may have monocular diplopia.

**SYMPTOMS.**—A high degree of hypermetropia is produced in emmetropic eyes; the accommodation is lost, the anterior chamber is deepened from the sinking of the iris, the pupil is small and iridodonesis or trembling of the iris is usually present. When due to disease, atrophy of the choroid and opacities of the vitreous are generally present.

**DIAGNOSIS.**—If the edge of the lens is in the pupil it will appear with the ophthalmoscope by the direct method as a dark border and a double view of the fundus be seen, one image through the lens and the other beyond the lens. Total absence of the lens is determined by the catoptric test, which is made in a dark room with a lighted candle passed slowly before the eye, when, if the lens is present, three images should be seen—a clear, distinct, upright image from the cornea; a second, also upright, but diffused and faint image from the anterior surface of the lens, and a third, small, sharp and rather bright image, which is inverted, from the posterior surface of the lens. If two or all of these images are seen, the lens is in place.

A dislocated lens will frequently become cataractous and may give rise to attacks of glaucoma, iritis, etc.

PROGNOSIS.—Congenital displacement, or ectopia lentis, usually occurs upward, upward and inward, or upward and outward. It is often hereditary and usually remains unaltered. Other defects are frequently found with congenital dislocation. When the displacement is due to disease, the vision is as a rule very bad and apt to grow worse. In traumatic cases the lens will usually become cataractous. Severe inflammation and glaucoma is apt to occur from a displacement into the anterior chamber.

TREATMENT.—If the dislocation is forward into the anterior chamber, removal of the lens by a peripheral incision is a very simple affair. In some cases it is first necessary to transfix the lens with a needle to prevent it from slipping back through the pupil again. If the dislocation occur from a rupture of the sclera and it lies beneath the conjunctiva it is easily removed. If the lens remain clear and is but partially dislocated, it should be left alone and the most suitable glasses be prescribed. Dislocation of the lens backward into the vitreous is a much more serious affair. When it is of long standing and has caused no irritation of the eye, it may be left alone. If, however, it rests in the front part of the vitreous particularly, and there are signs of inflammation which may lead to destruction of the eye, its removal should be attempted. The operation recommended by Knapp and Bull for the removal of lenses dislocated into the vitreous is, after thorough local anæsthesia, to make an upper corneal section and remove the speculum. The upper lid is now lifted away from the eyeball by the assistant, and through the lower lid pressure is made on the lower part of the eyeball and made directly *backward*. The lens will usually rise into the pupil and may come through the pupil and engage in the corneal wound, where the hook or spoon will usually become necessary to complete the removal. Failing to remove the lens by this procedure, or when the backward pressure causes an escape of the vitreous before the lens can be engaged in the wound, then the spoon or wire loop must be introduced into the vitreous and the lens extracted.

Dr. Agnew devised a double needle or bident which has been successfully used in a number of cases for the removal of a lens dislocated into the vitreous. It is used to fish up the lens and hold it from being pushed further backward by transfixing the globe about 6 mm. behind the cornea. The usual corneal section is then made and the lens extracted with the scoop, after which the bident is removed.



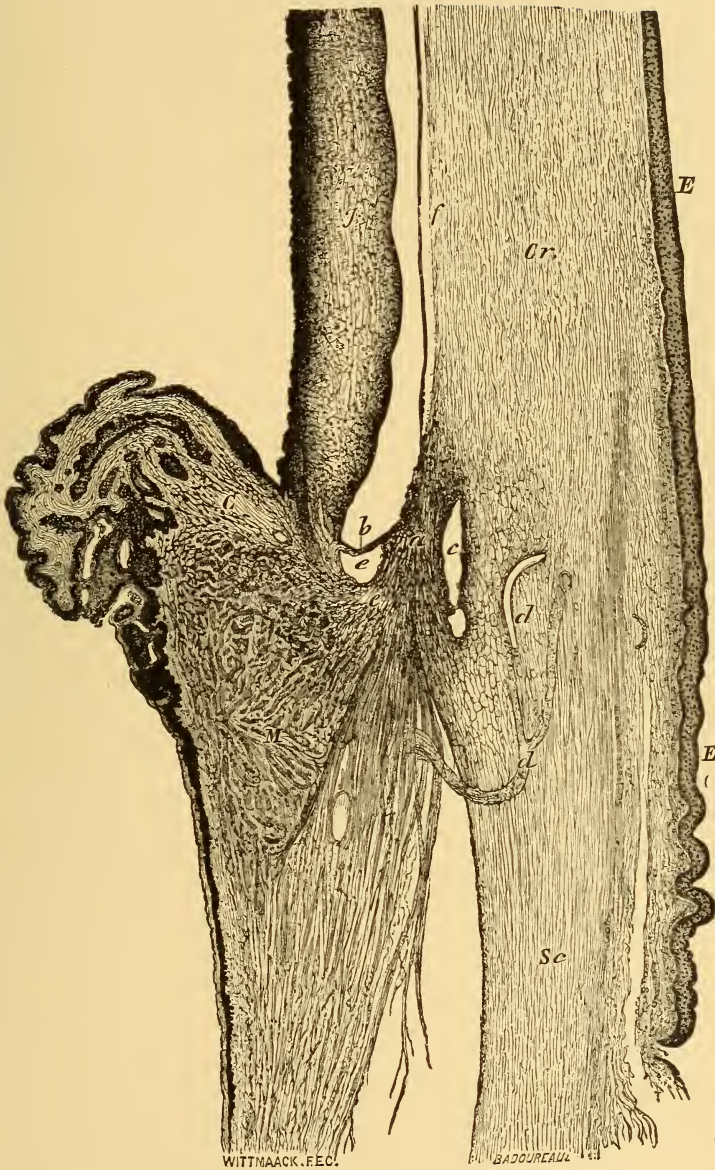
## CHAPTER XXIII.

## Glaucoma.

THE name comes down from olden times, and was employed because, in certain advanced cases, the pupil acquires a greenish hue (*γλαυκός*, green). Glaucoma should be more broadly defined as *an excess of pressure within the eye, plus the causes of and the consequences of that excess*. In the preparation of this chapter very liberal use has been made of the most excellent work by Priestley Smith on "The Pathology and Treatment of Glaucoma."

**Anatomy.**—The important part which the iritic angle plays in the causation of glaucoma makes a knowledge of its anatomical construction important. According to Waldeyer the iritic angle is the point where the tissue of the iris, cellular stroma of the ciliary body, muscle of accommodation, and the posterior and external portions of the cornea and sclerotic intersect (Fig. 89). These structures jointly form a peculiar cavernous tissue composed of flattened and rounded elastic trabeculæ, which, as a continuation of Descemet's membrane, forms toward the canal of Schlemm true fenestrated lamellæ. Into the composition of this trabecular tissue enters the elastic tendons and cellular tissue of the ciliary muscle. The membrane of Descemet splits up in this fenestrated lamellæ. Toward the anterior chamber this trabecular tissue is arranged cross-wise, leaving in front of the more closely constituted trabecular tissue large spaces called Fontana's spaces, which are simply the large meshes of the trabecular tissue that merges into the membrane of Descemet and is then called the ligamentum pectinatum iridis. Fontana's spaces communicate in this way directly with the anterior chamber. The canal of Schlemm is formed by a series of spaces or fissures of the cavernous tissue toward the external surface of the eye in the sclerotic, hence the spaces of Fontana and the canal of Schlemm are nothing more than a series of continuous lacunæ in the trabecular tissue and all com-

FIG. 89.



Section through the ciliary region (Waldeyer). *a*, cavernous tissue of the ligamentum pectinatum; *b*, prolongation of the iris; *c*, canal of Schlemm; *dd*, blood-vessels; *ee*, spaces of Fontana; *f*, Descemet's membrane; *I*, iris; *M*, ciliary muscle; *Cr*, cornea; *Sc*, sclera; *EE*, epithelium.

municating together. They belong to the lymphatic system and never contain blood during health. The canal of Schlemm communicates with the sclerotic veins and thus completes the connection between the anterior chamber and the venous circulation. A system of valves is supposed to exist which prevents the blood from passing into Schlemm's canal and the anterior chamber.

The zonula of Zinn is a transparent structure extending from the posterior surface of the ciliary processes to the lens. It is derived from the hyaline layer on the surface of the ciliary body, and, as it passes to the border of the lens, separates, leaving a small triangular space called the canal of Petit. Through this structure transfusion readily takes place from the vitreous to the aqueous humor.

**Physiology of Secretion and Excretion.**—The normal intra-ocular pressure is equal to about 25 mm. of mercury, and the pressures in the aqueous and vitreous chambers are equal. An excess of even 5 mm. in the vitreous would cause a displacement of the lens and iris. A tension of + 3 is equal to an intra-ocular pressure of about 80 mm., but a pressure equal to 200 mm. of mercury has been produced experimentally in animals by compression of the aorta and simultaneous irritation of the fifth nerve.

The maintenance of the normal pressure in the chambers of the eye depends upon the due secretion and excretion of the fluids which traverse them. The intra-ocular fluid flows from the blood stream. The ciliary body supplies the fluid to the vitreous, lens and aqueous, and is well adapted for this purpose by the peculiar arrangement of its secreting surface into ridges and grooves, which are in direct contact with the vitreous and aqueous. Pathological changes confirm this fact, for eyes excised in the first stages of infiltration of the vitreous show an inflammatory exudation extending into the vitreous from the ciliary body. In a shrinking of the vitreous it becomes detached from the retina, but remains adherent to the ciliary body. Disease of the ciliary body always tends to destruction of the vitreous. Priestley Smith has made an elaborate series of experiments regarding secretion and excretion and concludes that "the fluids which nourish the vitreous body and lens and fill the aqueous chamber are secreted chiefly by the ciliary portion of the uveal tract. The larger part



of the secretion passes directly into the aqueous chamber, forward through the pupil and out at the filtration angle. A very much smaller portion passes backward through the vitreous body and escapes at the papilla. The hyaloid membrane and zonula, which separate the two chambers, are readily permeable by the vitreous fluid."

The escape of the fluids from the anterior chamber by filtration through the ligamentum pectinatum into the canal of Schlemm and sclerotic veins has been proven by the experiments of Leber.

**PATHOLOGY.**—In the advanced stages of glaucoma there may be found, from the long existing intra-ocular pressure, pathological changes in nearly all the structures of the eye. The pathological changes have only been determined from examination of eyes that have been lost from glaucoma, and therefore only show the results of the increased tension without giving any light as to the cause of the disease. The most important changes are those found occurring at the iritic angle and which result in a partial or total occlusion of the vessels composing or entering into the canal of Schlemm. They consist of inflammatory changes at the junction of the cornea, sclera and iris. These changes seem to still further hinder the excretion of the fluids from the eye and in this way augment the trouble. The uvea in recent cases shows evidence of inflammatory œdema, with marked distension of its veins. The ciliary processes are greatly distended and push forward the periphery of the iris against the sclera and cornea, where there is formed a permanent adhesion. Later, from atrophy, there is a retraction of the ciliary processes away from the iris, but peripheral synechia remain. The iris atrophies, its vessels walls become thickened and their calibre becomes contracted or obliterated. The ligamentum pectinatum becomes condensed into tough, fibrous tissue, and, finally, even Schlemm's canal disappears. The ciliary muscle as well, as the processes atrophy and the atrophy of the choroid, results in obliteration of its vessels. In the cornea there is found between the anterior lamellæ, and especially between the epithelium and Bowman's membrane minute drops of fluid (Fuchs). The sclera gives evidence of inflammatory action and fatty degeneration. The aqueous is more albuminous than normal. The fibres of the optic nerve become



inflamed and atrophy in the later stages. The lamina cribrosa loses its power of resistance and is pressed backward. The retina shows a thickening and cystoid degeneration, with subsequent atrophy. There may be fluidity and detachment of the vitreous and the lens cataractous.

**SYMPTOMS.**—There are certain characteristic signs or symptoms of glaucoma more or less regularly found in all varieties of the disease which may be interestingly studied individually.

*Recession of the Near Point* or diminution of the range of accommodation is one of the earliest prodromal symptoms. As this disease is especially one of old age, we naturally have more or less presbyopia, but in glaucoma the presbyopia increases rapidly and is greater than it should be at that time of life. It is due to the increased intra-ocular pressure upon the choroid, ciliary body and suspensory ligament of the lens, causing a partial paralysis of the ciliary nerves.

*Changes in Refraction.*—Glaucoma may occur in any condition of the refraction, although hypermetropes are more predisposed to it, and it is found in from 50 to 75 per cent. of the cases. Glaucoma may also cause hypermetropia from a flattening of the cornea and slight shortening of the antero-posterior diameter of the eye from the pressure.

*Iridescent Vision.*—The halo or rainbow of colors around a light is perfectly circular, and the size and breadth of each colored ring increases the further the light is from the eyes. The intensity of the colors vary with the light, the red being the brightest by gas or candlelight and the blue by electric light. The arrangement of the colors is also the same. There is, first, a colorless space surrounding the light; the internal ring next to the colorless space is always the blue or bluish-green, while the outer ring is red. The generally accepted explanation as to the cause of the halo is, that it is due to a diffraction of the rays entering the eye, as a result of the opacity in the cornea.

*The Increased Tension.*—This symptom is the essential one that characterizes the disease. Nearly all the other symptoms and the pathological results of the disease are either directly or indirectly due to the increased tension. This symptom is due to an increase in the contents of the eye, but the cause of the increase in the contents is still not definitely settled. The degree of increased

tension may vary from  $T+?$  to  $T+3$ . For the method of determining the tension of the eye see page 22.

*Haziness of the Cornea* is usually present in all forms of glaucoma, excepting in glaucoma simplex, when it may be absent. The haziness is uniform, but most intense at the centre, and often shows a dull, stippled appearance of the surface. Haziness of the cornea either disappears immediately or soon after the tension becomes normal again. The haziness is due to an œdema of the cornea, and its rapid disappearance on the return of normal tension is owing to the elasticity of the cornea.

*Anæsthesia of the Cornea* is found in almost all cases of chronic glaucoma, and is apt to be more complete at some points than others. This anæsthesia is explained by Fuchs as due to an increased amount of fluid in the nerve channels, causing a distension, and that the nerve-fibres become paralyzed by the infiltration and pressure from this fluid, at some places he has found the nerve-fibres torn asunder.

*Dilatation and Inactivity of the Pupil.*—This is a very constant symptom of glaucoma. The pupil is often oval or egg-shaped, and, in this respect, differs from the dilatation in optic nerve atrophy when it is usually circular. The cause of the dilatation has been attributed to a paresis of the ciliary nerves from the pressure, and also, by some, to a constriction of the vessels of the iris. The irregularity of the dilatation is supposed to be due to a firmer attachment of the iris to the sclera at some points than at others.

*The Green Reflex from the Pupil* is due to the bluish-white tinge from the haziness of the cornea and aqueous, combined with the physiological yellow tint of the nucleus of the lens caused by age.

*Shallow Anterior Chamber.*—This is due to a pushing forward of the lens and iris and in old cases to the peripheral adhesion of the iris to the posterior surface of the cornea. It may be so shallow in some cases as to render an iridectomy very difficult.

*The Haziness of the Humors* is very slight and diffuse and is due to the increased amount of fluid within the eye.

*Enlargement of the Ciliary Veins* is due to the compression upon the venæ vorticosæ, causing a damming up of the blood, which has to pass off through the anterior ciliary veins.

*Pulsation of the Retinal Veins* may be physiological and is found in normal eyes. It is due to a transmission of the arterial wave through the vitreous, and is apparent at the papilla because the veins bend and are contracted at this point. The walls of the veins are thin and the pressure from the vitreous causes a momentary stoppage of the circulation until another arterial wave pushes the blood forward again. It is also noticed, in some instances, where an artery crosses a vein and the pulsation is then given direct to the vein. When absent, it may be owing to a hypertrophy of the walls of the artery, and, hence, no pulsation. As venous pulsation may be seen in normal eyes, it is not of especial diagnostic value.

*Pulsation of the Retinal Arteries at the Disc.*—There is, of course, a normal physiological pulsation of the arteries, but it is so slight as not to be seen in normal eyes, yet it may be produced by pressure upon the globe with the finger. It is so rarely seen under other circumstances that, when present, it is claimed by some to be almost pathognomonic of glaucoma. It is due to a resistance to the flow of blood, the current only being complete during systole. This resistance is caused by the increased intra-ocular pressure and possibly, as claimed by some, to an active spasmodic constriction of the vessels themselves. The absence of arterial pulsation in some cases is due to hypertrophy of the walls of the arteries.

*Pain.*—This symptom varies from a slight sense of fullness or dragging to a *most severe acute neuralgia* over the whole region supplied by the fifth nerve, and may be associated with general symptoms of pallor, fever, nausea and vomiting. The cause of the pain is pressure upon the nerves from the increased tension. In acute attacks the pain may be an intense agony associated with symptoms of great depression. In sub-acute cases the pain is less marked, while in chronic cases there may simply be a sensation of fullness or discomfort.

*Swelling of the Lids, Chemosis and Exophthalmos* are all due to infiltration from the pressure.

*Contraction of the Field of Vision* is usually a loss of the inner or nasal side first, followed by a loss of the lower, then the upper part of the field, showing an affection first of the temporal or outer half of the retina and then of the upper and lower quadrants. This

order of retinal affection is due to the vascular distribution. The temporal portion of the retina being less freely supplied with vessels, it becomes first affected from the pressure obstructing its capillary circulation. There is, however, in glaucoma no absolute constancy in the manner in which the field is affected, as there may be concentric restriction of the entire field, or sectional defects, and even in some cases a central scotoma with the periphery of the field remaining good. The color fields are usually contracted proportionate with the form fields.

*Excavation of the Optic Disc.*—More or less cupping of the disc is met with sooner or later in all forms of glaucoma, but it bears no close relation to the loss of vision. It is the result of the intra-ocular pressure upon the lamina cribrosa, which becomes pushed backward, and, when complete, the vessels are pushed to the inner or nasal side, the veins are large and the arteries small, the vessels bend sharply over the edge of the disc, becoming lost to view and reappearing again at the bottom of the cup, and the disc itself appears of a grayish-blue color. (See Chromo-Lithograph Plate III, Fig. 12.) Surrounding the papilla is a narrow yellowish-white ring, due to atrophy of the choroid. By an examination with the indirect method we can determine by the parallax test slight degrees of excavation. This shows, upon moving the object lens from side to side, an apparent movement, the edges of the papilla seeming to slide back and forth over the centre. From this we know that the edge of the papilla lies nearer to the eye of the observer than its centre. The depth of the excavation can be approximately estimated by the direct examination, allowing 3 D. to every millimeter of depth.

It is important to distinguish the excavation of glaucoma from that occurring physiologically and from atrophy of the nerve. (See Chromo-Lithograph Plate II., Fig. 2, and Plate III., Figs. 11 and 12.)

The *Physiological Cup* is white, occurs in a normally tinted nerve-head and never involves very much of the nasal part of the disc over which the vessels can be seen to course. The vessels can always be followed down the side of the cup, which is funnel-shaped and not deep like the cup of glaucoma.

The *Cup in Atrophy of the Nerve* is shallow and usually involves the whole of the disc. The vessels never bend sharply over its



margins. The nerve-head is abnormally white from diminished capillary circulation.

*The Cup of Glaucoma* is abrupt and deep, the vessels disappearing at its edge. There is a crowding of the vessels to the nasal side. It often has a greenish hue, and there is usually a yellowish choroidal ring around the papilla.

*The Impairment of Vision* varies considerably. In every acute attack it fails rapidly and then recovers somewhat when the symptoms subside, but each attack causes a little more destruction than the preceding one, until finally it becomes completely lost. The loss of vision is due to pressure upon the nerve elements of the retina and optic nerve, excepting in those cases where the loss of vision is sudden and complete, when it may result from an ischæmia of the retina.

*Photopsia*, or subjective sensations of light, is an inconstant symptom which may be present especially during attacks and may persist even after complete blindness and is probably due to a dragging upon the retina.

**COURSE.**—The history of a case of glaucoma will usually show a longer or shorter period of premonitory symptoms. This prodromal stage may have extended over several weeks or months, and then there will occur a sudden attack of acute glaucoma, lasting from a few hours to several days, when the symptoms subside and the eye returns to normal or nearly so. These attacks return, the intervals becoming shorter and shorter, the vision more and more impaired until finally it leads to a chronic or absolute glaucoma. In some cases an acute attack may continue directly into an absolute form without any subsidence of symptoms. Glaucoma does not lead to spontaneous cure, but tends, if unchecked, to absolute blindness.

**CAUSES.**—The statistics of glaucoma show it to form about one per cent. of all eye cases, varying, however, in different countries and different clinics. It is especially a disease of old age, some claiming that an attack of primary glaucoma under the age of thirty-five is extremely doubtful. Glaucoma simplex may occur in young people and it is also found in myopic eyes.

Sex seems to have little or no influence, and in some cases it seems to be hereditary. Hypermetropia predisposes to glaucoma, 50 to 75 per cent. of the cases being found in hypermetropic eyes.

Neuralgia of the fifth nerve may cause it, as does also irritation from decayed teeth. Attacks are often precipitated by hysteria, convulsions, nervous excitement, anxiety, mental disturbances, anger, fear, etc. Any condition causing vascular turgescence may cause it, as in gout, acute rheumatism, atheroma, climatic changes, intoxication, indigestion, fever, sleeplessness, etc. The use of atropine in some eyes will cause it. It has often occurred after an iridectomy for glaucoma in the other eye.

Priestley Smith concludes, from a study of the immediate causes of increased intra-ocular tension, that it may result from three conditions, viz.: "Hypersecretion by the ciliary processes, serosity of the fluids and obstruction at the filtration angle."

Hypersecretion may be expected from irritation of the fifth nerve or from dilatation of the ciliary vessels, and, while these conditions may serve to act as an exciting cause, he considers it a pure hypothesis.

The serosity of the intra-ocular fluids is probably a supplementary cause of increased tension, for, whenever the circulation of the blood is obstructed, serum is apt to escape from the capillaries. In a mild form of serous inflammation of the uveal tract there is a serous exudation, the aqueous is cloudy, punctate spots on the posterior surface of the cornea, dilated pupil and an increased tension, which may result in glaucoma from the serous nature of the intra-ocular fluids.

To an obstruction in excretion he chiefly attributes the cause of increased intra-ocular pressure. This obstruction at the iritic angle in glaucoma was first demonstrated by Knies\* and Weber† in 1876. Since then Priestley Smith has examined over eighty eyes having had various varieties of glaucoma and found obstruction of the filtration angle in all but three or four. As predisposing causes to this obstruction he considers the rigidity of the sclera that increases with age and the extra rigidity of the sclera found in Jews (who as a race are found to have a greater liability to glaucoma) one factor in the causation of glaucoma. The smallness of the eye, as demonstrated in the Egyptians, who, as a race, have small eyes and are especially prone to glaucoma, may

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\* Von Graefe's Archiv. Vol. xxii., 3.

† Von Graefe's Archiv. Vol. xxiii., 1.

be considered another feature. The increasing size of the lens in age, as demonstrated by him, seems, however, to be the most important predisposing factor in the causation of obstruction at the iritic angle with resulting glaucoma. His measurements further show that a small cornea belongs to a small eye, that the horizontal diameter of the cornea in glaucomatous eyes is less than that in healthy eyes, and that the size of the lens in small eyes is not proportionately small. The increase of the size of the lens in age without proportionate increase in the other structures of the eye causes it to encroach upon the surrounding parts; its margins press upon the ciliary processes, its anterior surface approaches nearer the cornea and in this way the depth of the anterior chamber is decreased. Priestley Smith summarizes as follows:

“The causes of primary glaucoma, then, are various and complex, and are not yet completely known; but they are alike in this—they all lead to compression of the filtration-angle. With that compression the actual glaucoma process begins. The escape of fluid is retarded and the intra-ocular pressure rises; this, in its turn, increases the compression of the filtration-angle. The fluid which still exudes from the turgid ciliary body is albuminous and less diffusible than the normal secretion; it tends to accumulate behind the lens, and this latter, being pressed forward, intensifies the mischief. Thus cause and effect react upon each other in a vicious circle.”

The theory of Priestley Smith does not satisfactorily explain all the phenomena of glaucoma, hence many other theories have from time to time been presented. The latest, that of Abadie\*, of Paris, presents features worthy of careful consideration. He argues that persistent changes at the iritic angle would necessarily cause persistent and not transitory symptoms. We know that we frequently have transitory attacks of both acute and sub-acute glaucoma, and he claims therefore that the nervous system must be interested in these transitory attacks that disappear without leaving a trace behind them. The old theory that the fifth nerve played this important rôle, in the light of recent investigations, must be abandoned, as it is a nerve of sensation only, and that the trophic influence which this nerve was claimed to have upon the

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\* Ophthalmologische Klinik, November, 1897.

nutrition of the eye must be attributed to the sympathetic branch which accompanies it.

He then claims that the true origin of the disease is an excitation, at times transitory, again permanent, of the vaso-dilator nerve-fibres of the blood-vessels in the eye resulting in either the acute or chronic forms. The increased tension results from the increased blood-pressure in the vessels, which perhaps also increases the intra-ocular secretions. He cites the action of mydriatics and myotics as the most positive proof that glaucoma is due to dilatation of the blood-vessels. Atropine producing dilatation of the vessels aggravates the glaucomatous symptoms. Eserine on the contrary constricts the vessels and lessens the intensity of the glaucoma.

He further claims that the good results of an iridectomy in glaucoma substantiates his theory and says that the success of the operation rests solely upon breaking up the circular set of excitor nerves which regulate the dilatation and constriction of the blood-vessels. These nerves are situated in the middle part of the iris, and Abadie says that only this portion of the iris need be removed, and that even a simple slit without excision would be sufficient. That the reason the removal of either the pupillary or ciliary margin of the iris, or sclerotomy, is only a partial success is because this ring plexus of nerves in the centre of the iris is not removed.

Galezowski\* considers glaucoma to be due to an alteration of nutrition through an obliteration of the lymph-vessels and distension of the lymph-canals, plastic exudation around the canal of Schlemm, hyaline degeneration of the walls of the vessels of the iris, rigidity of the lamina cribrosa, and concentration of lymph at the entrance of the optic nerve.

The causes of secondary glaucoma are those of some previous disease of the eye which obstructs the excretion.

*Annular Posterior Synechiæ*, by partially or totally obstructing the passage of the fluids from the posterior to the anterior chambers, causes glaucoma because the secretion going on, the iris becomes pushed forward and closing up the filtration-angle increased tension sets in. Iridectomy may be advisable in annular synechiæ to prevent glaucoma.

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\* Rec. d'Oph., July, August, 1894.



*Anterior Synechia*, from some perforating wound or ulcer of the cornea, causes an insufficient access to the filtration-angle.

*Dislocation and Injuries of the Lens* will often be the cause of glaucoma. When dislocated into the anterior chamber it causes a stoppage of the filtration-angle, a lateral dislocation causes by pressing forward the iris and ciliary processes. An injury of the lens by the keratome in iridectomy, needling of a soft cataract, or penetrating wounds of the eye injuring the lens, causes swelling with pressure upon the iris and glaucoma. The lens should be immediately removed in these cases. Glaucoma occurs in some cases after extraction of the lens and also after discission for secondary cataract. Intra-ocular tumors and hæmorrhages also cause increased tension. In serous exudations from the uveal tract, glaucoma results from diminished filtration power of the fluids. Glaucoma has also been seen in eyes with a detached retina.

DIAGNOSIS.—The importance of an early diagnosis in this disease cannot be over-estimated, and the most usual prodromal symptoms are, a frequent changing of the reading glasses, the halos around a light and periods of obscuration of vision. In all cases, the chief symptoms to be looked for are the enlarged ciliary veins, anæsthesia and haziness of the cornea, irregularity of the pupil, contraction of the field of vision, pulsation of the retinal arteries, cupping of the optic disc and increased tension.

Acute glaucoma has frequently been mistaken for iritis, and in some cases the differential diagnosis, which practically rests upon the increased tension and dilatation of the pupil in glaucoma, is extremely difficult. The inflammatory symptoms of both give the same appearance, the fundus is often not to be seen in either, there may be haziness of the cornea in both, and the iridescent vision may occur in iritis as well as glaucoma. Add to this the fact that the two diseases may occur at the same age, that Atropia may have been used in the eye with partial dilatation of the pupil and the difficulty to accurately determine the tension in an acutely inflamed eye may render the differential diagnosis extremely uncertain. The two diseases may even exist together. For the differential diagnostic signs see page 290.

Glaucoma simplex and optic nerve atrophy are, according to

Schweigger,\* often mistaken for each other. The essential diagnostic point seeming to rest upon a comparison of the field of vision in the two diseases, which would, of course, be aided by the presence of any or all of the following symptoms of glaucoma: The history, halos, pain, increased tension, more rapid progress, depth of the cup and arterial pulsation. The peripheral color sense is not so markedly defective in glaucoma as in atrophy. We have also seen cases where the failing vision has been attributed to cataract, but the mistake could hardly be made by any careful observer. Other cases we have seen attributed to a cold in the eye, the pain said to be neuralgia, and instillations of Atropia used. This inexcusable error could not have been made had the tension of the eye been examined.

PROGNOSIS.—In all forms of glaucoma the prognosis is always bad, if the disease is allowed to follow its own course, as blindness inevitably results sooner or later. When, however, the proper treatment is undertaken in acute glaucoma the prognosis may be said to be favorable, doubtful in glaucoma simplex and unfavorable in the absolute or hæmorrhagic glaucoma. That is, in acute glaucoma, the further progress of the disease can often be stopped and vision, as a rule, preserved where it is without further loss; where the disease has been of but a short duration, there may be complete restoration of sight after an iridectomy.

Varieties of Glaucoma.—This disease may be divided into two general classes; *primary glaucoma*, which arises without previous disease of the eye, and *secondary glaucoma*, or that form in which we can see some previous disease of the eye to account for the glaucoma.

Glaucoma Acuta.—Usually the patient has had warning of impending danger in the way of certain *premonitory symptoms*—due to an increased tension and not to inflammation. There is premature recession of the near point. This impairment of the accommodation, where the patient is unable to use his ordinary glasses, but keeps changing every little while for stronger and stronger ones, is always suggestive of glaucoma. He complains

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\* Archiv. Ophthal., vol. xx., 4, 1891.

also of having noticed a periodic dimness of vision, as though clouds of smoke were coming before the eyes from time to time. There is seen a rainbow of colors encircling a light, and, upon examination of the eye at this time, there will be detected a slight increase of the tension; the cornea is a little dull and diffusely clouded, the pupil is dilated and sluggish, the field of vision may be contracted and there may be a hyperæmia of the retina. Such an attack lasts a few hours, when the eye returns to normal, and may remain so for weeks or months, when another similar attack occurs. These infrequent attacks may occur for years, the eye gradually undergoing changes so that it is not normal between attacks, and in this way gradually pass into a chronic glaucoma. As a rule, however, the attacks become more and more frequent, when suddenly there comes on an attack of acute glaucoma. The onset is apt to occur during the night and sets in with severe pain in the eye and head, which increases in severity and is accompanied by rapid loss of vision and often by vomiting, fever and general prostration. These attacks are usually brought on by some sudden excitement or grief, or some venous congestion as from a feeble heart. Upon examination of the eyes we may find any or all of the following symptoms: The lids are swollen and may be cedematous; conjunctiva inflamed, possibly chemosed; scleral vessels injected, eyeball protruded, lachrymation, photophobia, cornea hazy and may have lost its sensitiveness to touch, iris discolored, pupils dilated and sluggish, greenish reflex from the pupils, aqueous cloudy and anterior chamber shallow. There is intense pain in the eye and head, *the eyeball is hard*, the vision impaired and the field contracted. Ophthalmoscopic examination is often unsatisfactory on account of the haziness and general inflammation of the eye; but, if possible, there may be seen an excavation of the optic disc, the retinal arteries are small and pulsate, the retinal veins enlarged and there may be slight extravasations of blood.

An attack of acute glaucoma may last from a few hours to several days or weeks, when the symptoms will gradually subside, the vision improves and the eye becomes normal again. These attacks usually follow one another, the intervals growing less and less, until it finally passes into what is called chronic or absolute glaucoma. In some cases the first attack will be of unusual

severity, in which the vision does not return, the tension does not decrease and the dullness of the cornea persists. These cases are called *glaucoma fulminans*. The cupping of the optic nerve is, frequently not present in an attack of acute glaucoma. The impairment of the vision may mean that it is reduced to the faintest glimmer of light, which De Wecker says is due to ischæmia of the retina. The pain in acute glaucoma is often so intense that the patient may ignore a complete loss of vision and demand relief for his neuralgia, and in this way often mislead the physician.

**Glaucoma Chronica.**—This form may develop from an acute attack, or directly from the premonitory stages. In fact, it generally does not amount to an actual attack, but develops gradually the symptoms of the acute, irritation being absent.

Among its symptoms we find the anterior ciliary veins enlarged and tortuous, the sclerotic has a dull, leaden hue, the cornea is hazy and loses its sensitiveness to touch, the pupil is large and inactive, the iris is discolored and becomes atrophied, the anterior chamber is shallow, the tension is increased, may be  $+3$ . An ophthalmoscopic examination shows an excavation of the optic disc, the retinal veins large and the arteries small and pulsate. There is a progressive failure of sight, the field becomes more and more contracted and the halo around the light is seen. The pain in chronic glaucoma varies, though, as a rule, is not so violent. If the disease has come on gradually it may be entirely absent, though rarely so, and in other cases it may be severe. There may be a remission of the symptoms in some cases, or they may continue all the time, but become increased from nervous excitement. Chronic glaucoma gradually leads on to absolute.

**Glaucoma Simplex.**—This is considered by those who claim glaucoma to be a non-inflammatory disease to be the most characteristic form, as in this variety of glaucoma there are no inflammatory symptoms. We will simply find an increased tension which may vary at different times, but usually not elevated to the degree we have in other forms, and in some cases we may never find the tension distinctly increased. The pupil is dilated and sluggish, though, as a rule, not so much so as in acute or chronic. The vision is impaired and the field contracted, there is no pain



or haziness of the cornea and with the exception of some distension of the anterior ciliary veins the eye looks quite normal. With the ophthalmoscope there is seen an excavation of the optic disc, some choroidal atrophy around the disc and displacement of the retinal vessels. The characteristic signs of glaucoma simplex are the increased tension, excavation of the disc and the regularity with which the pressure acts upon the circulation of the retina, first limiting and then abolishing the field of vision. The central vision, as a rule, gradually diminishes but sometimes remains good until the field of vision has become almost lost. The absence of pain and inflammation together with the very gradual loss of vision renders the patient often unconscious of any trouble until late. In the excavation of the disc in glaucoma the edge of the disc overhangs so that the vessels wholly or partially disappear from view as they pass over the margin of the disc; some claim they are always displaced toward the inner side and believe that in any excavation where the vessels are not so displaced the cupping is not the result of glaucoma. The choroid around the excavated disc in glaucoma may be detached by the pressure, often presenting the appearance of posterior staphyloma. Glaucoma simplex is usually chronic in form and may terminate in acute inflammatory glaucoma or in absolute. Fuchs says: "Glaucoma simplex always attacks both eyes," but this statement is not borne out in my own experience.

**Glaucoma Hæmorrhagica.**— This may be considered a primary glaucoma when associated with hæmorrhage, or secondary when it is caused by hæmorrhage. The symptoms are the same as those already detailed under acute or chronic forms, plus the greater tendency to hæmorrhage on account of the degeneration of the vessels. The hæmorrhage occurs especially from the retinal vessels. Varicose and aneurismal dilatations, together with changes in the walls of the retinal vessels, have been frequently found. Sudden relaxation of the tension by an iridectomy has often resulted in a serious intra-ocular hæmorrhage, causing destruction of the eye. The pain in this form of glaucoma, when there may be but even a slight increase of the tension, is often unbearable and frequently necessitates enucleation. In many cases the hæmorrhage is the cause of the outbreak of acute

symptoms when there were no glaucomatous signs before. Hæmorrhagic glaucoma generally affects but one eye and is usually found in old people with arterio-sclerosis.

**Glaucoma Absolutum.**—By this we mean a glaucoma that has run its course, or all cases that have resulted in a total loss of sight. The results vary somewhat, whether due to acute, chronic, or simple glaucoma.

*Result of Acute or Chronic Glaucoma.*—In this the anterior ciliary veins are large and dark, especially at the recti muscles; the conjunctiva is thinned, the sclera pale, the cornea rough, hazy and not sensitive to touch; the pupil is dilated to a mere rim, which is in contact with the cornea; the lens is cataractous and pushed forward near to the cornea, the pain often continues severe and the patient has the subjective symptoms of photopsies and chromopsies.

*Result of Glaucoma Simplex.*—In these cases the eyeball will usually appear healthy and may be free from pain, but there is extreme hardness of the ball, excavation of the disc, choroidal atrophy around the disc, arteries contracted, anterior chamber shallow, pupil dilated (may be contracted) and vision entirely lost. An eye may remain in this condition for years or pass into degenerative changes at any time.

In the last stages of an absolute glaucoma from any form, the eyeball may enlarge, cornea flatten and sclera bulge. This process is accompanied by severe pain until finally the eyeball ruptures and passes over into atrophy. Another change is where the eyeball shrinks, the secretion all the time growing less, the tension becomes minus and atrophy ensues. This last change may or may not be accompanied with pain, and inflammatory attacks may occur.

**Glaucoma Consecutiva.**—The preceding forms of glaucoma have resulted from a loss of balance between secretion and excretion in previously healthy eyes, that is, due to either an increased secretion or an obstructed excretion in eyes in which there was no other apparent disease. In this there is a similar disturbance in eyes showing other diseased conditions. All affections of the eye become glaucomatous when, with other symptoms, there is an

increase in the tension. The symptoms, then, of secondary glaucoma are increased tension, which may be the only symptom. The accommodation and refraction may be impaired, but, as a rule, the other diseases of the eye will hide this. The vision is impaired, may have iridescent vision, the field is contracted, more or less severe pain, anterior chamber shallow, pupil dilated if not bound down by posterior synechiæ from other disease. There is marked dilatation of the episcleral vessels and cupping of the disc. Often there are changes in the form of the globe and the condition terminates in atrophy, as in glaucoma absolutum. The most frequent causes of secondary glaucoma are total adhesions of the iris. Isolated adhesions may also lead to it. Injuries and luxations of the lens. Atheroma of the retinal vessels and tumors of the interior of the eye may cause.

TREATMENT.—This should vary according to the stage of the disease; taken in the premonitory stage where the patient suffers from only occasional attacks of temporary blindness, pain, etc., while in the interval the vision is good, we may look for benefit from the use of remedies. The best local remedy to be considered is either the sulphate or salicylate of eserine, which may be employed in the strength of from one-half to two grains to the ounce of water and may be instilled into the eye as often as every hour, and should in itself speedily cut short an attack. Pilocarpine in twice the strength of eserine is preferred by some. Even in some cases of acute glaucoma, if used early and often, the necessity of an operation may be postponed, if not permanently avoided. In all cases the use of eserine should be early, *very early*, hence we believe it best in cases once having had a premonitory attack, that the patient should be supplied with the eserine with directions as to its use that no time should be lost. The action of the eserine is to cause contraction of the iris and in this way it is drawn away from the iritic angle and the filtration passages opened; it also, by constriction of the vascular system of the eye, diminishes secretion. Mydriatics, especially atropine, must be avoided, as they are liable to cause an acute attack of glaucoma.

*Iridectomy.*—The introduction of this operation for the relief of glaucoma was empirically made by von Graefe, in 1857, and is still *the* operation for this disease. Iridectomy has been the means of saving useful vision in thousand of patients who would other-

wise have been hopelessly blind. While iridectomy is the most valuable remedial agency extant for this disease, still it is not infallible, as in some cases or forms of glaucoma even this operation will not check the disease. The operation is preferably made early, before the vision has been too long affected. In acute glaucoma we can expect to retain the vision where it is at the time of the operation, and if not too long standing we usually get more or less improvement in the sight. Iridectomy may also be made to relieve the pain even after the vision is totally and permanently destroyed. It sometimes happens where the first iridectomy has not relieved, that the second or even the third iridectomy or repeated sclerotomies will do so. In acute inflammatory glaucoma an iridectomy is, as a rule, extremely favorable. In

FIG. 90.



Parenteau's sclerotomy knife.

operating, the previous use of eserine is advisable, as it renders less liable accidents from sudden relief of the tension, and it has also been advised by Arlt and others that it be used in the sound eye as well, for the mental anxiety caused from the dread of an operation has been considered not infrequently to have been the cause of an attack in the good eye. Ether should, as a rule, be used in this operation, as thorough anæsthesia cannot be obtained from cocaine in a glaucomatous eye. The incision should be made entirely in the sclera, the iridectomy large and care taken not to injure the capsule of the lens, which is liable to occur owing to the shallow anterior chamber, and that the escape of the aqueous be very gradual. The beneficial results of an iridectomy in glaucoma simplex are quite problematical, the statistics of many prominent operators showing that only about one-half of these cases are cured by an iridectomy.

*Sclerotomy* has been strongly advocated by De Wecker, but it has not seemed to have met with the hearty support of the other authorities. In certain cases, especially the hæmorrhagic form of glaucoma, sclerotomy may with advantage take the place of iridectomy. The writer has had the best of results from this operation



in a few instances. Sclerotomy is often only resorted to after an iridectomy has failed to give relief. Sclerotomy has usually been made with a Graefe cataract knife, the incision being made wholly in the sclerotic, a bridge of tissue being left above. I have, however, used for the last three years Parenteau's sclerotomy knife (Fig. 90) as much safer and easier to use while giving equally good results. This knife is used exactly the same as a keratome in iridectomy.

In the premonitory stage, as has already been said, our endeavor should be to cure by the aid of internal medication, which may be done in many cases if we take into consideration the constitutional disturbances which are associated with or cause the intra-ocular trouble. The habits of our patient should receive careful attention. The excessive use of stimulants (either alcohol or tobacco), or any exhaustive mental or physical labor must be strictly forbidden. Only moderate use of the eyes should be allowed, and, during the attacks, or when they follow each other in rapid succession, complete rest is necessary. Bright light, either natural or artificial, should be avoided, or the eyes protected by colored glasses. The diet should be good and nutritious, particularly in elderly persons, and all indigestible substances forbidden.

*Massage*, according to Fick, is of service in the after treatment and in cases of simple glaucoma where futile operations have been performed, to retard as long as possible the decline in visual acuity. "The result of massage is instantaneous, the hard eyeball grows soft under the physician's finger, so to say, but its effect is not lasting. The patient should, therefore, learn to massage himself, and practice it daily."

The results from the use of internal remedies alone in glaucoma seem to me somewhat problematical. In the majority of cases recorded, where no operation was made, the local use of eserine was employed as well as the remedy, and in consequence it is unscientific to give the credit to the remedy alone.

**Gelsemium.**—Is one of the principal remedies in this disease and is, perhaps, more frequently used than any other. There seems to be no especially characteristic symptoms upon which it is given, hence we come to the conclusion that its use has depended upon the fact that clinically it has proven its value.

**Bryonia.**—From its value in serous inflammations in general, this remedy has been given with benefit in glaucoma. It is more often indicated in the prodromal stage. The eyes feel full, as if pressed out, often associated with sharp, shooting pains through the eye and head. *The eyes feel sore to touch and on moving them in any direction.* There may be a halo around the light, with heavy pain over the eye, worse at night. The usual concomitant symptoms will decide us in its selection.

**Aconite** may be of service at the commencement of an acute attack when we have much heat, redness and burning pain in the eye, together with fever and other symptoms of the drug generally.

**Osmium.**—This remedy has proven of value in the hands of some, and from its symptoms should be given a more thorough trial. It has sudden, sharp, severe pains in and around the eye. Dimness of vision, objects seen in a fog. Halo of various colors around a light.

**Phosphorus.**—Of great importance in improving vision and removing many subjective symptoms after iridectomy. Fundus hyperæmic and hazy, halo around the light, and various lights and colors (especially red) before the eye. Sensation as if something was pulled tightly over the eyes. Vision impaired, better in the twilight.

**Belladonna.**—Of benefit in relieving the severe pains of glaucoma, especially if accompanied by throbbing headache and flushed face. The eyes are injected, pupils dilated, fundus hyperæmic and pain both in and around the eye. The pains are usually severe and throbbing; may come and go suddenly and are *worse in the afternoon and evening.* The eyes are hot and dry, with *sensitiveness to light.* Halo around the light, red predominating. Photophobia.

**Asafoetida.**—Glaucoma, with severe, *boring pain over the eye,* and around it.

**Cedron.**—For the relief of the pains of glaucoma, when they are severe and *shooting along the course of the supra-orbital nerve.*

**Colocynth.**—Of service in relieving the pains of glaucoma when they are severe, burning, aching, sticking or *cutting* in character in the eye and around, always *relieved by firm pressure*

and by walking in a warm room; aggravated by rest at night and upon stooping.

**Nux vom.**—Indicated if the *morning aggravation* is very marked and for the resulting atrophy of the optic nerve.

**Prunus spin.**—*Pain severe, crushing, in the eye, as if the eye were pressed asunder, or sharp, shooting through the eye and corresponding side of the head* (Spig.) Aqueous and vitreous hazy, fundus hyperæmic.

**Rhododendron.**—Incipient glaucoma, with much pain in and around the eye, periodic in character and *always worse just before a storm, ameliorated after the storm commences.*

**Spigelia.**—*Pains sharp and stabbing through the eye and head, worse on motion and at night.*

Our range of drugs will be extensive in this affection, as we must take into consideration all the general symptoms to make a sure prescription. The above remedies have been most often called for in the cases we have met, though the following may be found useful: Arn., Ars., Aur., Cham., Con., Crot. tig., Ham., Kali iod., Macrotin., Merc. and Sulph.

PART II.

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THE

OPHTHALMIC THERAPEUTICS.





# OPHTHALMIC THERAPEUTICS.

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## ACETIC ACID.

**Clinical.**—The benefit obtained from Acet. ac. in croupous inflammation of the air-passages led to its use in croupous conjunctivitis. Though empirically prescribed at first, it has proved of decided value in certain forms of this inflammation. It is adapted to those cases in which *the false membrane is dense, yellowish-white, tough and so closely adherent* that removal is almost impossible; thus differing from Kali bichr., in which the membrane is loosely attached, easily rolled up and separated in shreds or strings. The lids are œdematously swollen and red, especially the upper, which hangs down over the lower. It does not seem to correspond to the diphtheritic form of conjunctivitis, for, though the false membrane is closely adherent, it does not extend deeply into the conjunctival tissue—no scars remaining after resolution—and at no time is there firm, rigid infiltration of the lids. Little or no benefit can be derived from its use if the discharge is profuse and purulent, mixed with small portions of the membrane, or if the cornea has become involved.

Compare Arg. nitr., Pulsat. and Hepar.

## ACONITE.

**Objective.**—*The lids (especially the upper) are swollen, red and hard, with a tight feeling, worse mornings. Edges of lids sore, red and inflamed. Pupils dilated. The conjunctiva is intensely hyperæmic and œdematous, mostly toward the inner canthus. Lachrymation with local inflammations is usually slight, if any.*

**Subjective.**—In the lids, *dryness, burning, sensitiveness to air.* Pressure into the upper lids, as if the whole ball were pushed into the orbit, causing a bruised pain in the eye; itching, smarting, *burning in the eyes*, especially worse in the evening. Sticking

and tearing pains around the eyes, worse at night. The eye is generally sensitive, with *much heat, burning and aching*, worse on looking down or turning the eyes; feeling as if the eyes were swollen, or as if sand was in them. The ball, especially the upper half, is sensitive if moved; feeling as if it would be forced out of the orbit, relieved on stooping; the ball feels enlarged, as if protruding and making the lids tense. Sparks before the eyes, flickering. Vision as through a veil; it is difficult to distinguish faces, anxiety and vertigo. Photophobia.

**Clinical.**—Aconite is the remedy for inflammations of the eye in general, which are very painful, with *heat and burning*, as well as dryness; also for inflammatory conditions *resulting from injuries*, ranging from those of a most severe character, as when all the tissues of the globe have been injured by a perforating wound, to those dependent upon the irritant action of *foreign bodies* in the cornea or conjunctiva, or the irritation caused by *ingrowing lashes*.

Sometimes it is indicated in acute inflammation of the lids or lachrymal sac, though not as frequently as some other remedies.

The verifications of this drug in the following forms of inflammation of the conjunctiva are every-day occurrences: *Catarrhal inflammation* (first stage, prior to exudation), marked by great redness, heat, burning and pain; chemosis, with pain so terrible that patient wishes to die. Early in purulent inflammation, as illustrated in the case of a child with following conditions: Lids red and swollen; intense redness of conjunctiva and chemosis, worse in the right eye; much purulent discharge, with heat and sticking pains; aggravated in the morning.

*Acute aggravations of granular lids and pannus*, with excessive hyperæmia, heat and dryness, especially if the aggravation be induced by overheating, from violent exercise, or by exposure to dry, cold air.

Affections of the cornea seldom require its use, except when of traumatic origin, although one case of superficial ulceration of the cornea in a woman fifty years of age which had been present ten days, with burning heat in the eye and sharp pain on looking at the light or reading, was quickly relieved under Aconite<sup>3</sup>, after Hepar had failed.

Benefit may be derived in the acute stage of scleritis, with con-

tracted pupils, sticking or tearing pains, photophobia, blue circle around the cornea and aching in the ball. (Compare Spig.)

For *traumatic iritis* Aconite is one of the first remedies to be thought of. It may also be required in simple plastic iritis when caused by exposure to cold, or in recurrent iritis.

Of use in the earlier stages of violent acute inflammation of the deep structures of the ball, when it becomes sensitive to touch and feels as if it were protruding (rarely, if ever, called for after the exudative stage is reached).

The following case illustrates the good effects of Aconite in *asthenopia*: A middle-aged man was employed to sort railroad tickets, to run through columns of figures and do other fine work by a dim light; in eight days he began to have a spasmodic closure of the lids and heavy feeling over the eyes; then his eyes would get very hot—"felt as though they could set a match on fire," or as after a lash with a whip. The conjunctiva of the lids was intensely red, with constant winking and closing of the lids; could hardly force them open. The heat was always dry and temporarily relieved by cloths wet in cold water; vision normal; refraction normal. Aconite relieved these symptoms magically and allowed the man to continue his work (which he was obliged to do) till time enabled him to change his occupation.—T. F. A.

In a case of *paralysis of the ciliary muscle* of one day's standing, caused by sleeping near an open window, the accommodation was wholly restored within forty eight hours after using Aconite<sup>30</sup>.

### AGARICUS.

**Objective.**—The lids are half-closed, swollen, especially toward the inner canthus; ptosis, *twitchings of the lids*, with a contracted palpebral fissure, without swelling. Twitchings of the ball, often painful; twitching of the ball while reading (especially the left); very little appearance of inflammatory action.

**Subjective.**—Pressure and heaviness in the eyes, especially painful on moving them or exerting them by lamplight, with left-sided headache and involuntary twitching of the facial muscles. Yellow spots before the vision when looking at white. The bitings, itchings and jerkings about the brow and in the lids are very numerous in the provings. In the eyeball the sensations are mostly pressive and aching; the ball is sensitive to touch. Vision



dim, as through a veil, with flickering; reads with difficulty, as the type seems to move. Short-sightedness. Beating in vertex driving almost to despair. Headache with chorea. Tearing in the head.

**Clinical.**—Agaricus is of the greatest service in spasmodic affections of the lids and muscles of the ball. Its value can hardly be overestimated in *morbid nictitation* or chorea-like spasms of the lids, with general heaviness of them, especially if the *spasms occur on waking*, or are relieved temporarily by washing with cold water. Four drop doses of the tincture, two or three times a day, will often relieve when the higher attenuations have no effect.

Dr. Linnell reports a case of lagophthalmos of the left eyelid with paralysis of the same side of the head. There was marked twitching of the eyelids on the unaffected or right side, together with right trigeminal neuralgia. These symptoms which had existed for one year were promptly cured by Agaricus.

An interesting case of anæmia of the optic nerve, retina and choroid, with a general tendency to chorea, has been cured by this drug.—T. F. A.

Benefit has been obtained from Agaricus in myopia dependent upon spasm of the ciliary muscle, especially if complicated with twitchings of the lids.

Its usefulness in *nystagmus* is illustrated by the following case: A school girl, æt 14, was unable to read, owing to spasm of the orbicularis and oscillation of the globes. The motion was circulatory in both eyes and continual, whether eyes were fixed at near or far points; it caused much pain, indistinctness of vision and occasional attacks of vertigo. In three months' treatment with Agaricus, 3d trit., a powder three times daily and gymnastic exercises of the ocular muscles, the globes were so far controlled as to cease oscillating when the vision was fixed upon near objects. Improvement continued.—W. H. WINSLOW.

That its action upon the muscles is not confined to spasm is shown in the following case of weakness of the internal recti: A lady suffered from muscular asthenopia consequent upon uterine disorders and spinal anæmia. The spine was very sensitive to touch between the shoulders. She could not fix the eyes long even upon distant objects; could not converge the eyes (weak internal recti). She had sudden jerks in the ball itself; twitches

of the lids and at times in other parts of the body; the lids seemed heavy, as if stuck together, but were not; she had been given prisms (which allowed binocular vision without effort) and had been under various forms of general and local treatment. After *Agaricus* the change was marvellous; within a week the eyes could be fixed on objects at ten feet without conscious effort; the unpleasant sensations had entirely vanished and the patient was enabled to begin systematic gymnastics for the eye (initiated by fixing the eyes on a white object while it is moved slowly right and left). The eyes have steadily improved, but the old pain returned in the spine; relieved only temporarily by applications of cold water.—T. F. A.

### ALLIUM CEPA.

Lachrymation excessive, especially of the left eye, with redness of the eyeball after frequent sneezing. *Lachrymation* (not ex-coriating) *with coryza*. The lachrymation is for the most part in the evening in a warm room, the left eye weeps more and is more sensitive to the light. Sensation as if something were under the lid. Burning and smarting in the eyes as from smoke, wants to rub them.

**Clinical.**—Of use in *acute catarrhal conjunctivitis*, associated with a similar condition of the air-passages, as in hay-fever; the lachrymation is not ex-coriating, though the nasal discharge is (reverse of *Euphrasia*). Dr. Liebold first recommended this drug in five-drop doses of the tincture for *ciliary neuralgia after cataract extraction*. G. S. N. reports a case of irido-choroiditis in a young man somewhat subject to iritis. The inflammation began in the iris with the usual symptoms and, although the pupil was kept dilated with atropine, the inflammation progressed until the chemosis became excessive, the eyeball very sensitive to touch, the aqueous and vitreous so clouded that the fundus could not be seen, the vision was lost and the pain in the eye extending to the whole head, worse on the right side and aggravated at night, became almost beyond control. His nerves were completely shattered from pain and loss of sleep and it was feared that the eye was lost. *Allium cepa* was given in five-drop doses with most rapid relief of the pain and inflammation.

### ALUMEN EXSICCATUM.

**Clinical.**—This substance, first recommended by Dr. Liebold, has been employed with great benefit in *trachoma*, by dusting the crude powder upon the inner surface of the lids, allowing it to remain about a minute, more or less, and then washing off with pure water. At the same time the lower preparations are given internally. As a saturated solution in glycerine it may also be used with great benefit in trachoma and pannus.

### ALUMINA.

**Objective.**—The upper lids are weak, seem to hang down as if paralyzed, especially the left lid; the lashes fall out; small pimples or incipient stytes on the lids. Twitching of the lids, especially right upper. Redness and inflammation of conjunctiva, worse in right eye and aggravated in the evening. Lachrymation, hot or even acrid, may be present, but absence of lachrymation predominates. Squinting of the eyes.

**Subjective.**—Burning and dryness in the lids every evening, with pain in the internal canthus of the left eye and much dry mucus in the morning on waking; morning agglutination; the eyes burn on being opened, with photophobia; itching in the canthi; dryness and excoriation in the internal canthi. In the eye in general the sensations are: Burning; burning on waking, especially on looking up; pressure on the eyes, cannot open them; also photophobia.

**Vision.**—Dim vision, with a sensation as if the lids would adhere in the corners; dim vision, as through a fog, or as if hairs or feathers were before the eyes. In the evening the vision is dim and eyes dry, so that she cannot use them.

**Clinical.**—Alumina is indicated in chronic inflammation of the lids in which there is dryness and smarting without much destruction of tissue (ulceration) and without great thickening of the lids.

Nictitation, dependent upon enlarged papillæ of the conjunctiva, has been relieved.—J. H. BUFFUM.

Some cases of *chronic granular lids*, or loss of power in the upper lids, met with in old, dry cases of granulations, yield only to this drug. The evening dryness and dimness of the eyes, with

inability to use them, have been verified in cases of chronic dry catarrh.

Dr. A. Wanstall recommends Alumina very highly for both acute and chronic *catarrhal conjunctivitis*, especially the latter, and sends me this case illustrating its action: Miss A., æt. 18, artist, for a year or more has been unable to use her eyes at night. Hm.  $\frac{1}{30}$ . Eyes inflame after using; palpebral conjunctiva especially inflamed, with rough appearance on lower lids (follicular); dry scurfs on lashes. The patient declined to wear glasses. Alumina was prescribed, and in one week she reported: "I can now read with more ease at night," and in six weeks she was entirely cured.

Alumina should be one of our most important remedies for loss of power of the internal recti (compare Conium and Natr. mur.) and for paralytic squint.

#### AMMONIUM CARBONICUM.

Eyes weak and watery, especially after reading. A large black spot floats before vision after sewing.

**Clinical.**—Ammon. carb. is especially serviceable in cases of muscular asthenopia from overstraining the eyes by prolonged sewing, etc. (Compare Ruta, Natr. mur.).

#### AMYL NITRITE.

Under the ophthalmoscope the veins of the disc were seen to become enlarged, varicose and tortuous; the arteries small, but not abnormally so; conjunctiva bloodshot; protruding, staring eyes; sight hazy; stupefaction; dull, heavy pressure over the eyes, as if a heavy weight were within.

**Clinical.**—Amyl nitr. is one of the two remedies most frequently indicated in a form of ciliary neuralgia with acute conjunctivitis dependent upon disturbances in the vaso-motor system.

This drug has been found of great service in some cases of exophthalmic goitre, one case of which has been completely cured by the olfaction of Amyl. nitr. alone.—T. F. A.

Embolism of the central artery of the retina has been reported as cured by the olfaction of the Nitrite of Amyl.

#### ANTIMONIUM CRUDUM.

Small humid spots in the external canthus which are very pain-



ful if sweat touches them; mucus in the canthi mornings with dry crusts on the lids. Eyes red and inflamed, with itching and agglutination nights and photophobia mornings; lids red, swollen and excoriated. Itching in the canthi.

**Clinical.**—This drug has cured, or assisted in curing, some obstinate cases of *blepharitis* in which the lids have been inflamed, swollen and moist, with pustules on the face; especially when occurring in cross, peevish children. (Compare Graphites.)

Marked success has been observed from the use of this remedy in *scrofulous ophthalmia* when occurring in cross children and characterized by pustules on the cornea or conjunctiva, with profuse mucous discharge and lachrymation; lids swollen, red, excoriated and bathed in the secretions; accompanying which will be found pustular eruptions on the face, moist eruptions about and on the ears, soreness of anterior nares, swollen upper lip, etc.

### ANTIMONIUM TARTARICUM.

In cross, peevish, fretful children with *phlyctenular ophthalmia*. The photophobia is usually quite marked but may be absent. The lids are tightly squeezed together. Redness with lachrymation.

### APIS.

**Objective.**—*Lids much swollen, red and œdematous; often everted; the upper lid hangs like a sac over the eye.* Erysipelas of the lids; they are dark bluish-red and so swollen as to close the eye, following severe pains; the swelling extends around the eyes and down over the cheek. The conjunctiva becomes congested, puffy, œdematous and full of dark red veins. Lachrymation hot, spurts out of the eye. Lachrymation with burning in the eyes and with photophobia; with pains in the eyes on sewing, evenings; with pain on looking at bright objects; with severe burning and sensation of a foreign body in the eye.

**Subjective.**—Burning, *stinging* and sensation of swelling around the left eye in the superciliary ridge. Soreness of the lids and canthi, with agglutination; burning of the edges of the lids, causing lachrymation. Stinging or itching in the internal canthi, or smarting of edges of lids. *Stinging in the ball* and pain across the forehead; aching pressing in the lower part of the

left eyeball. Fulness inside the ball, with flushed head and face. Violent pains over the right eye extending down to eyeball. Smarting and sensation of burning in the eyes, with bright redness of the conjunctiva. *Stinging pains*; most dreadful pains shoot through the eye in inflammations; pains throbbing and burning; pains aggravated on moving the eyes; photophobia; eyes pain and are easily fatigued on exertion.

**Clinical.**—The clinical record of this drug is important, verifying nearly all its symptoms. It is especially adapted to *oedematous conditions of the lids or conjunctiva*, particularly non-inflammatory; inflammations with burning, biting pains; inflammations with severe shooting pains, heat of the head, red face, cold feet, etc.; erysipelatous inflammations of the lids, with adjacent smooth swelling of the face, especially with chemosis.

It is also indicated in various forms of *blepharitis* with thickening or swelling, such as incipient phlegmon, with great puffiness and stinging pains. Chronic blepharitis with thickening of conjunctival layer, so that the lower lid is everted.

Ulceration of the margins of the lids and canthi with stinging pains may require this remedy.

Occasionally of service in acute *catarrhal conjunctivitis*, if there is bright redness of the conjunctiva and chemosis, with stinging pains; also in *ophthalmia neonatorum*, with great swelling of the lids and adjacent cellular tissue.

Various and severe forms of *keratitis* have been cured by Apis, although I believe its sphere of usefulness in diseases of the cornea is very limited. Keratitis, with dreadful pains shooting through the eyes, with swollen lids and conjunctiva, with photophobia and hot lachrymation gushing out on opening the eyes (see Rhus). Pustular keratitis with chemosis, dark red conjunctiva and swollen lids. Ulceration of the cornea, vascular, with photophobia, lachrymation and burning pain; lids everted and often ulcerated on the margins.

An interesting case under my care in the N. Y. Ophthalmic Hospital shows that Apis may be of service in parenchymatous keratitis. A boy, 11 years of age, was brought to me with the right cornea densely infiltrated, moderate redness and photophobia. Inflammation was just commencing in the left eye. The history of hereditary syphilis was tolerably clear. There was an

exostosis on inferior maxilla; the joints were enlarged and painful, so that he could not walk; high fever and loss of appetite. He was taken into the hospital and several remedies given with no avail. Both corneæ became worse, when infiltrated and inflamed, until vision was nearly lost in both eyes. His fever also increased and was accompanied with drowsiness and thirstlessness. Apis<sup>1</sup> was given, with immediate relief of the drowsiness, fever and inflammatory symptoms of the eye. Under its influence the cornea began at once to clear and a complete cure was the final result.

A case of hydrops retinæ, with pressive pain in the lower part of the ball, with flushed face and head, was partially relieved by Apis, but not cured.—T. F. A.

Asthenopic troubles, especially affections from using the eyes at night, causing redness of the eyes, with lachrymation and stinging pains, may call for this remedy.

The character of the pains will usually serve to distinguish the Apis from the Rhus cases, which are objectively very similar. Apis does not seem to control suppurative inflammations of the deep structures of the eye as does Rhus, though the puffiness of the lids might seem to indicate it; these cases are at first generally painless and the external swelling is not bright red, as are the local and external troubles of Apis.

The burning, hot lachrymation calls to mind Arsen., but the discharges are not acrid and excoriating in Apis, though they feel burning hot; besides the Arsenicum cases usually present a well marked cachexia.

### ARGENTUM METALLICUM.

Margins of lids very thick and red. Violent itching and stinging in the canthi.

**Clinical.**—This remedy has proved useful in some cases of *blepharitis*, relieving the severe itching of the lids and angles of the eye. One case of stricture of the lachrymal duct improved very rapidly under its use until lost sight of.—T. F. A.

### ARGENTUM NITRICUM.

**Objective.**—Ophthalmia, often with intense pain, abating in the cool and open air, but intolerable in a warm room. *The con-*

*conjunctiva*, both *ocular* and *palpebral*, becomes greatly swollen, congested and infiltrated, with scarlet redness. The *caruncula lachrymalis* is swollen and looks like a lump of red flesh; clusters of intensely red vessels extend from the inner canthus to the cornea. *Profuse mucous discharge* in the morning on waking, with dullness of the head, especially in the forehead and root of the nose. The margins of the lids are red, sore and thickened, with but little secretion; the canthi red and sore. Opacity of the cornea.

(From the local application of this drug, most violent inflammation of the conjunctiva, of the lids and eyeballs ensues, with profuse muco-purulent discharge which is not excoriating to the lids.)

**Subjective.**—Heaviness over the eyes, which open with difficulty. Boring above the left eye. Infra-orbital neuralgia. Photophobia. Burning, biting and itching in the eyes, especially in the canthi; heat and pain in the ball on motion and touch; aching pain, deep in the eye, early in the morning.

**Vision.**—The letters become blurred before the eyes; the sight vanishes when reading or writing. Vanishing of sight. Obscuration of sight with anxiety; heat in the face and lachrymation; gray spots and bodies in the shape of serpents move before the vision.

**Clinical.**—It is useful in *blepharitis* if the lids are very red, thick and swollen, especially if complicated with granulations, conjunctivitis or some deeper inflammation of the eye. In one case of ciliary blepharitis with entropium, caused by being over a fire, and ameliorated in the cold air or by cold applications, it effected a cure.

Acute conjunctivitis resulting from bathing, with profuse discharge and dark redness of the conjunctiva, has been relieved.

Nitrate of silver is not homœopathic to granular lids in the later stages, but is the appropriate remedy in the early stages of *acute granular conjunctivitis*, in which the conjunctiva is intensely pink or scarlet-red and the discharge is profuse and inclined to be muco-purulent. Although these may be confounded with *Euphrasia* cases, there is a wide difference, more easy to recognize than to describe. In *Euphrasia* the profuse discharge causes soreness of the lids and more or less swelling; the character of the inflammation is more acute and short lived and, as a rule, the redness is much less brilliant. In Nitrate of silver cases we may, in-



deed, have very little discharge, except, perhaps, flakes of mucus, when the patient complains of itching and biting in the eyes and a dry, burning sensation without real dryness. (Cantharis has intense heat and real dryness; Sulphur is very often indicated in these dry conjunctival catarrhs, especially if there be sharp sticking pains under the lids as if splinters were sticking into the eyeballs. Compare also Alumina, Graphites and Natr. mur.)

The greatest service that Argent. nitr. performs is in *purulent conjunctivitis*. With large experience in both hospital and private practice, not a single eye has been lost from this disease when seen before the cornea has been destroyed, and most of them have been treated with nitrate of silver, which should be used internally and in all severe cases locally as well. In the mild cases where the discharge is not excessive and the chemosis not great I am in the habit of using a solution of from ten to twenty grains of the first potency to the ounce. When the discharge is thick, yellow and profuse, especially if the chemosis is extensive, it should be used locally in a solution of from two to five or even ten grains to the ounce. In the very first stages of purulent conjunctivitis it may sometimes be aborted by a single application of a solution of nitrate of silver, thirty grains to the ounce. The most intense chemosis, with strangulated vessels, most profuse purulent discharge, even the cornea beginning to get hazy and looking as though it would slough, have been seen to subside rapidly under this treatment. The subjective symptoms are almost none; their very absence, with the *profuse purulent discharge* and the swollen lids, swollen from being distended by a collection of pus in the eye or swelling of the sub-conjunctival tissue of the lids themselves (as in Rhus or Apis) indicates the drug.

It has also relieved and contributed to the cure of diseases with destruction of tissue, as *ulceration of the cornea*; in one case with pains like darts through the eye mornings, better evenings; in another case there were small ulcers on the upper part of the cornea with much inflammation, burning pain and profuse discharge.

It has also been useful in kerato-iritis, with violent congestion of the conjunctiva; the cornea was vascular and eroded, with terrific pains from the vertex into the eye and with burning heat in the eyes.—T. F. A.

Coldness of the eye, with boring pain in the head and sensation as if the scalp was drawn tightly, has been removed by Arg. nitr.—T. F. A. (Fluor. ac. has a sensation of cold air blowing into the eye.) In the Arg. nitr. cases we sometimes meet with trembling of the whole body and headaches.

A case of retino-choroiditis was successfully treated by this remedy.—W. H. WOODYATT.

Arg. nit. has greatly improved two cases of atrophy of the optic nerve.—C. M. THOMAS.

Dr. Woodyatt was the first to call attention to Arg. nitr. as a remedy for weakness or *paralysis of the accommodation*. Since then it has been found of great service in many cases of this kind, especially if dependent upon errors of refraction, in which the asthenopic symptoms on using the eyes are not relieved after correction with the proper glasses.

### ARNICA.

The margins of the upper eyelids are painful when the lids are moved, as if they were too dry and a little sore. Cramp-like tearing or pressure in the eyebrow (left). Headaches between the eyes. There is some burning and itching of the eyes with slight lachrymation and photophobia. Feeling of heaviness of eyes; eyeballs are inflamed.

**Clinical.**—Arnica has been employed with marked success in a variety of eye troubles resulting from blows and various injuries; sometimes applied locally (tincture diluted with water) and sometimes given internally. It seems to be better adapted to contused than lacerated wounds, and to injuries before inflammatory symptoms have become prominent, although benefit has been derived from its use in inflammations of the lids, conjunctiva, and even of the whole globe, when of traumatic origin. (Acon., Calend.)

In hastening the absorption of extravasations of blood in the conjunctiva, aqueous humor, retina, or other ocular tunics, especially if resulting from injuries or the straining in whooping-cough, Arnica often acts well; it seems also, sometimes, to correct the relaxed condition of the blood-vessels and the too fluid condition of the blood, which predisposes to sub-conjunctival hæmorrhages in whooping-cough. (Hamamelis is more frequently

used in hæmorrhages into the anterior chamber, and *Ledum* in sub-conjunctival ecchymoses.)

In two cases of traumatic detachment of the retina, Dr. Hunt has observed the retina become re-attached under the influence of *Arnica*<sup>30</sup>.

### ARSENICUM.

**Objective.**—*Eyelids swollen and œdematous*, first the upper and then the lower (this swelling is mostly non-inflammatory and painless); the œdematous lids are firmly and spasmodically closed and look as if distended with air. *Blepharo-adenitis*; edges of lids very red. Continual trembling of the upper eyelids, with lachrymation. Cornea degenerated. Conjunctiva inflamed; extreme *redness of the inner surface of the eyelids*. *Lachrymation and discharges from the eye excoriate the lids and cheek*. Anxious expression of the face.

**Subjective.**—Sub-orbital pain on the left side with prickings as with needles, sometimes quite severe. Pain in the margin of the eyelids on moving them, as if they were dry and rubbed against the eyeballs. *Burning on margins of lid*. In the evening a feeling as of sand in the eyes, obliging him to rub them. *Burning in the eyes*; eyes hot, with burning, sore pain in the balls, and a feeling as if they had no room in the orbit. Pulsative throbbing in the eyes and with every pulsation a stitch; after midnight. Photophobia. Ciliary neuralgia with fine burning pains.

**Clinical.**—Only by concomitant symptoms can we distinguish between Arsenicum and Apis for *non-inflammatory œdematous swelling of the lids*, as both are indicated in this condition.

Blepharitis following erysipelas ten years previous, with scaly condition of edges of the lids and dry, smooth, scaly skin, was cured by this remedy.—J. H. BUFFUM.

Its value in *croupous conjunctivitis* following ophthalmia neonatorum was illustrated in a child three weeks old. The discharge was moderately tenacious, stringy and yellow-white in color. The lids were slightly œdematous. The right cornea was clear, but the palpebræ (especially lower lid) was covered with shreds of exudation, loosely attached but easily removed, leaving a bleeding surface and hypertrophied papillæ. On the lower half of the left cornea was a large ulcer which had perforated and the remain-

der of the cornea was opaque. The conjunctiva of the lower lid was covered with a dense, white, semi-transparent, fibrinous exudation which could not be removed without much force. A similar membrane was present on the upper lid, but not as dense nor as firmly attached. After Arg. nitr., Bromine and Chlorine water had failed to improve, Arsen.<sup>30</sup> was given on account of the restlessness after midnight and desire to nurse often and little. A solution of alcohol (зj ad ʒij) was used locally at the same time. The membrane rapidly disappeared and the ulcer healed, leaving a slight purulent discharge which Arg. nitr. controlled.

Arsenicum may be called for in chronic *trachoma*, in which the internal surfaces of the lids are inflamed, painful, dry and rub against the ball, especially if there are *intense burning pains and excoriating lachrymation*.

In *scrofulous ophthalmia* this remedy has been frequently employed with success, especially in ulcers of the cornea, with soreness of the internal surface of the lids, which are swollen and spasmodically closed, so that opening them causes intense burning, sticking pains, worse at night, excessive photophobia and acrid lachrymation; tears gush out on opening the eyes; eyes can be opened well in the cool, open air, but not in the house, even in a dark room; eyes feel as if they had no room in the orbit; throbbing, pulsating in the eyeballs and around the orbit, with general ulceration of the cornea recurring first in one eye and then the other, especially in young people who are anæmic (in one case when the eyes were better the feet were swollen); ulcer on outer side of cornea with elevated edges, pain like the pricking of needles, excoriation of the external canthus, burning and sticking pains.

Vascular elevations on the cornea resulting from ulceration, aggravated by opening and closing the eyes, with violent, burning pains every afternoon, have been benefited.

*Parenchymatous keratitis* may require the use of this remedy, as, for example, the following case occurring in my clinic and treated by Dr. Charles C. Boyle: Mrs. J., æt. 30, had suffered from an inflammation of the eyes for eleven weeks. Both corneæ were very hazy, densely infiltrated and vision nearly lost, especially in the right eye. There was deep ciliary injection and commencing vascularity of the cornea; much photophobia and lachryma-



tion; *burning pain in the eye and over the brow, worse about four A. M.*; shooting pain in the ball, over the head and down the cheek; sensation like pins and needles sticking in the eyes, worse at night. Pupil dilated slowly under Atropine. No specific history. For one week Cinnab.<sup>3</sup> and Aur. mur.<sup>3</sup>, with Atropine externally, were prescribed with only an aggravation of the symptoms. Arsen.<sup>3</sup> was then given with almost immediate amelioration of pain and rapid diminution of the inflammatory symptoms. One week later the 30th was prescribed. In about four weeks the haziness of the cornea had so nearly disappeared that with correcting glasses vision was  $\frac{20}{80}$ .

Several cases of kerato-iritis with burning pains over the orbit, worse at night and with profuse acrid lachrymation, have been cured.

Benefit has been derived from its use in syphilitic iritis and also idiopathic iritis, characterized by burning pains in the eye, worse at night, especially after midnight, with great restlessness and much thirst.

Arsen. cured a progressive choroiditis disseminata which alternated with bronchial catarrh; when the eyes were better the chest was worse, and vice versa. There was heat in the eyes and burning in the chest, with dyspnoea and a whole train of Arsenic chest symptoms.—T. F. A.

The favorable results obtained from use of Arsen. in *retinitis albuminurica* are sometimes very gratifying, as shown in the following case: Miss M. P., æt. 20; retinitis albuminurica fully developed in both eyes. L. V. counts fingers at two feet. R. V.  $\frac{20}{70}$ . Right ventricle hypertrophied; appetite variable; bowels regular; great thirst for small amounts; occipital headache of a pricking character; tongue large, dry and yellowish; menses too often and venous; breath oppressed and pulse irregular. Cured in two months by Arsenicum 3d and 30th, and Sulphur<sup>30</sup>. Last report: No albumin; R. V.  $\frac{20}{20}$ ; L. V.  $\frac{10}{50}$ .—W. S. SEARLE.

Both Arsenicum and Rhus are often indicated in scrofulous cases, but the paroxysmal character of the pains, the extreme prostration often present, the burning, sticking pains and the excoriating discharges will distinguish Arsenic. The brilliant red inner margins of the lids and the dryness of the inner surfaces are very marked indications for its use in trachoma. The nervous

irritability associated with the symptoms of Arsenic is a very pronounced anæmic hyperæsthesia.

Arsenic cases are generally relieved by warm applications. They are very frequently periodic in their occurrence, commencing every fall, and often alternating from one eye to the other.

### ARUM TRIPHYLLUM.

**Clinical.**—A brilliant cure of catarrh of the lachrymal sac, with *desire to bore into the side of the nose*, was made by this drug.—C. A. BACON.

### ASAFÆTIDA.

*Severe boring pains above the brows.* Tearing pain in the forehead; dull pressure at the external border of the left orbit. Troublesome dryness of the eyes. Periodic burning in the eyes and pressing together of the lids, as if overcome with sleep. Burning pain in the ball from within outward. Throbbing pain at night relieved by pressure.

**Clinical.**—Asaf. is very useful in *ciliary neuralgia*, and from its power of relieving the intense boring, burning pain in the brows, especially at night, has arisen its very beneficial action in certain forms of deep-seated inflammation of the eyeball attended by these ciliary pains and turbidity of the humors, as in iritis, kerato-iritis, irido-choroiditis and retinitis, especially if of syphilitic origin. The pains are usually throbbing, beating, boring or burning in character, either in the eye, over or around it; they are often intermittent, extend from within outward and are ameliorated by rest and pressure (reverse of Aurum).

Asaf. has relieved a sharp pain extending through the eye into the head upon touching.

### ASARUM.

**Clinical.**—Asthenopia, accompanied by congestive headaches, has been cured. The eyes were worse morning and evening, when outdoors in the heat and sunlight; were better in the middle of the day and from bathing them in cold water.—T. F. A.

### ATROPINUM.

About 9 p. m. eyelids felt heavy and difficult to keep open.

Sharp pain under the right eye, with slight pain in the temples. Neuralgic pains commencing under the left orbit and running back to the ear, lasting perhaps ten minutes at a time and then disappearing for fifteen or twenty; these have been noticed for several hours. Hard, tense eczematous swelling and redness of the lids.

**Clinical.**—Its wholesale and empyrical application for therapeutical purposes is unwise and often unsafe, since we have few accurate data upon which to base a prescription of Atropine to cure (it should never be used when Belladonna is indicated, since Atropine does not comprise Belladonna).

It is a very happy provision that the local application of Atropine to a healthy eye almost always spends its whole drug power upon the peripheral nerve-fibres of the iris and ciliary muscle and that very seldom do any constitutional symptoms arise. In twenty years' experience we have seen no single bad effect from the use of strong (four grains to the ounce) solution of Atropine for dilating the pupil in order to examine the fundus. Its use should always be avoided in all stages of glaucoma, as cases are reported of most violent inflammation following its use in that disease (though Belladonna does not seem to be at all homœopathic to glaucoma, as the action of Atropine is probably mechanical).

If an attack of *iritis* could be promptly recognized and met at the very beginning, before the exudative stage is reached (that is, within twenty-four hours), there *might* be no need of Atropine; but if exudation has taken place and the inflammation is violent, use immediately a strong solution of Atropine, a drop every one to four hours; it will not materially interfere with the action of remedies. It is, however, *in all cases, the safest plan*, for, if adhesions take place, an iridectomy will usually be required. In severe cases, in which the congestion of the capillaries is enormous and the iris, being so full of blood, cannot dilate, Aconite may be employed in frequent doses to reduce the hyperæmia. In rare cases of this kind even cupping of the temples may be justifiable as a temporary expedient to enable us to obtain a dilated pupil. This being accomplished, remedial measures may be resumed and continued.

Its use is recommended for the relief of ciliary neuralgia.

## AURUM.

**Objective.**—Redness and swelling of the lids. Redness of the sclerotic; constant lachrymation; photophobia; morning agglutination; eye very red and angry looking.

**Subjective.**—Burning, stitching, drawing and itching in the inner canthus of the eyes and in the lids; sensation upon using the eyes, as of violent heat in them; pressure in the eyes and constant feeling of sand in them; pressive pain in the right ball from above downward, also from without inward, worse on touch; pain in the eye from blowing the nose. Bones around eyes feel bruised.

**Vision.**—Hemiopia, *the upper half of the field of vision seems covered by a black body*, the lower half visible. He cannot distinguish anything clearly, because he sees everything double and one object is seen mixed with the other, with violent tension in the eyes. Vision indistinct as through a veil.

**Clinical.**—In considering the clinical application of Aurum in ophthalmic diseases, no distinction will be made between metallic gold and the muriate, for experience has not yet demonstrated that there is any practical difference between these two preparations.

In blepharitis it is rarely useful, though it may be called for, especially in syphilitic patients after the abuse of mercury, if the lids are red, swollen and ulcerated.

For *trachoma* with or without *pannus* (especially with), there is probably no remedy oftener indicated than Aurum. Its characteristics are not well marked, but its usefulness has been confirmed in a variety of cases; there is commonly much photophobia, lachrymation and pain, burning or dull in character, compelling one to close the lids, usually worse in the morning and ameliorated by the application of cold water; although one or more of these symptoms may be absent without necessarily contra-indicating this remedy.

For ulcerations and pannus-like thickening of the outer layer, Aurum is of great service, especially in cases of scrofulous ophthalmia with ulcerations and vascularity of the cornea; with great irritability of the patient; great sensitiveness to noise; photophobia; profuse, scalding lachrymation; sensitiveness of the eyes to touch; swollen cervical glands; pains from without inward, worse on touch (reverse of Asaf.).



No remedy has given greater satisfaction in the treatment of *interstitial keratitis* than Aurum muriaticum and many cases of this sluggish form of inflammation have yielded promptly to its use. Its sphere of action does not seem to be closely circumscribed, for rapid improvement has followed its use in cases of a scrofulous origin, as well as in those which can be traced to *hereditary syphilis*. The *cornea is more or less opaque* and may be very vascular or not. The degree of ciliary injection, photophobia and pain is variable. Its verification in cases dependent upon hereditary syphilis is of frequent occurrence. In old, obstinate cases of superficial ulceration of the cornea with moderate redness, photophobia and lachrymation.

In low forms of *episcleritis* in which the cornea is becoming infiltrated from the sclera, with moderate redness, pain and photophobia, benefit has been derived from Aurum.

Favorable results have followed its use in *iritis* and *kerato-iritis*, particularly the syphilitic variety, and after the abuse of mercury. There is usually much pain around the eye which seems to be deep in the bone and to extend from without inward; aggravated by touch. In one case recently under my care in which the improvement and cure was remarkably rapid under Aur. mur.<sup>3</sup>, there was great swelling of the iris, extensive posterior synechiæ, large *gumma of the iris*, haziness of aqueous, with deposits on posterior surface of the cornea, tending to extension into the parenchyma, together with much pain and soreness around the eye; worse at night.

It is almost a specific for exudative chorio-retinitis with exudations in the vitreous.—T. F. A.

*Hemiopia*, in which the right half of objects is invisible, has been helped, though not cured. But the form of hemiopia to which Aurum is especially adapted is when the patient can see nothing above the median line, as the following case will illustrate: Some years ago a gentleman, who had taken large quantities of iodide of potash, complained that the vision of the left eye had been failing for a year and a half; he could not see the upper half of a room or any large object, though the lower half was clear; no pains in the eye; objects seemed smaller and more distant; had some black spots before vision; was always worse as the day progressed and better in the morning; twitching in the upper lid.

On inquiry it was found that he had syphilis ten years ago, but had not been recently troubled with secondary symptoms, except that a large bursa-like swelling on the wrist had persisted a long time. Vision was  $\frac{5}{200}$ . Upon ophthalmoscopic examination there was found chorio-retinitis (chronic) with an accumulation of fluid beneath the retina, which settled to the lower portion of the eye and caused a large *detachment of the retina*. *Vitreous hazy from infiltration*. Right eye normal; refraction normal. Knowledge of the pathological conditions here gave no clue to the remedy, and we were obliged, this time at least, to rely upon the symptomatology (as one should always be ready to do). The remarkable symptom of not seeing anything in the upper half of the field of vision is of course the most prominent. Taking the history of the case into account and the previous dosing with iodide of potash, Aurum<sup>200</sup> was given, under which he steadily improved, the haziness of the vitreous almost entirely disappeared; the inflammation of the retina subsided and in one year the vision rose to and remained at  $\frac{15}{100}$ , beyond which it would not go, for the retina was partly disorganized and could not be repaired with retinal tissue. —T. F. A. Since then several cases of retinal disease have been successfully treated with Aurum, though in some cases no improvement followed and the remedy only served to arrest further progress of the malady (compare Gelsem.). Aurum cases will usually be found to follow overdosing by potash or mercury and perfect vision can never be expected from the nature of the tissue changes.

Its reported benefit in paralysis of the muscles from syphilitic periostitis seems reasonable, though I have not yet had occasion to verify its action.

### BADIAGA.

Bluish purple margins of lids. Headache, extending to the eyeballs. Pains in the eyeballs, extending into the temples, aggravated by turning them in either direction. Slight aching pains in the posterior portion of both eyeballs and in the temples (with headache from 2 P. M. till 7 A. M.). The left eyeball quite sore, even upon closing it tightly.

**Clinical.**—This variety of sponge has been useful in some cases of exophthalmic goitre and should always be thought of in this disease.

Has proven of value in some cases of *scrofulous ophthalmia* with enlarged cervical glands.

### BARYTA CARBONICA.

Redness of the conjunctiva, with swollen lids and dryness of the eyes. Itching of the eyes. Sensation as of a gauze before the eyes in the morning and after a meal. Light dazzles the eyes, with fiery spots before the eyes in the dark. Photophobia.

**Clinical.**—Dr. Dudgeon advises its use in scrofulous inflammations of the eye characterized by phlyctenules and ulcers on the cornea, especially when associated with glandular swellings.

Has been of service in checking the advancement of cataract.

### BARYTA IODATA.

**Clinical.**—Up to the present time no proving has been made of this substance, so that its sphere of action is hypothecated from its composition; clinically, it has proved a great addition to our armamentarium. It was first introduced to notice as an ophthalmic remedy by Dr. Liebold, who says that it is especially adapted to diseases occurring in scrofulous subjects, in which there is great swelling of the glands, particularly of the lymphatics, "which feel like a string of beans everywhere between the muscles down to the spinal column; they can be felt of all sizes and all degrees of induration; some may be suppurating, while others have healed with an ugly scar." It has been used very successfully in chronic recurrences of *phlyctenular keratitis* and *conjunctivitis* found in the above subjects.

Dr. Woodyatt has reported a cure of specific *interstitial keratitis* of both eyes, in which vision had decreased so that fingers could not be counted at more than four feet, complicated with enlargement of the cervical glands which were hard and painful on pressure. Since then I have verified its usefulness in one case of parenchymatous keratitis.

### BELLADONNA.

**Objective.**—The eyes are protruding, staring and brilliant. The eyes become distorted, with redness and swelling of the face; spasms of the eyes; the eyes are in constant motion. Lids puffy, red and congested; inflammatory swelling of the lower lid near

the inner canthus, with throbbing pains, etc. Conjunctiva red, tumefied. Lachrymation, with great photophobia. Total absence of lachrymation; motion of the eyes attended with a sense of dryness and stiffness; the conjunctival vessels fully injected. Pupils (at first, or from large doses) dilated; (afterward, or from minute doses) contracted. *The optic disc greatly deepened in tint, and the retinal arteries and veins much enlarged, the veins most markedly so.*

**Subjective.**—*Eye dry, motion attended with a sense of dryness and stiffness.* Pain and burning in the eyes. Feeling of heat in the eyes; it seems as if they were surrounded by a hot vapor. Burning heat in the eyes. The surface of the ball became quite dry, which caused a very disagreeable, and uncomfortable sensation, which could not be relieved by winking or continued closing of the eyes. Pressive pain deep in the ball when she closed the eyes; feeling as if the eyes protruded. Severe throbbing pain in the eye and head, worse at night.

**Vision.**—Dimness of sight or actual blindness. Every object in the room, both real and spectral, had a double or at least a dim outline, owing to the extreme dilatation of the pupils. *Everything* he looks at *seems red*. A large halo appears round the flame of the candle, partly colored, the red predominating; at times the light seems as if broken up into rays. Occasional *flashes of light before the eyes*; sparks of electricity before the eyes, especially on moving them; large, bright sparks before the eyes. *Photophobia*. Diplopia. Flickering before the eyes. When walking in open air, black spots and stripes before the eyes, rapidly appearing and disappearing. Objects passing before the eyes have an undulating motion.

**Clinical.**—The use of this drug in inflammatory diseases of the eye is much more limited than is generally supposed.

Erythema and erysipelatous inflammation of the lids often require the administration of Belladonna.

It may be of service in some forms of *conjunctivitis* (especially catarrhal in the early stages) with dryness of the eyes, thickened, red lids and burning pains in the eyes, though not as frequently called for as Aconite. Its use may be necessary in acute aggravations of various chronic diseases, as in granular lids, when, after taking cold, the eyes become *sensitive to air and light*, with dry-



ness and a gritty feeling in them; or in chronic forms of keratitis in which the eye suddenly becomes intensely congested, with excessive photophobia, heat and pains which may be throbbing or sharp, shooting through the eyeball to the back of the head.

Idiopathic iritis has been cured in the early stages by this remedy, but it is not often indicated. Two cases, however, of *simple plastic iritis, resulting from a cold on the eighth day after a cataract extraction, in which the pains are severe and of a throbbing character in and above the eye, worse at night*, were promptly relieved under Bell.<sup>30</sup>, after Atropine, cold and warmth externally, and Rhus, Merc. and Bry. internally had been given a faithful trial for several days with no improvement.

Mydriasis resulting from nervous headache has been relieved.

In *diseases of the fundus*, Belladonna has been a most valuable remedy. It has been employed with great advantage in hyperæmia of the choroid and also in inflammation, especially the disseminate form of choroiditis. There will usually be found accompanying these cases much headache, congestion of the head and considerable photophobia.

Bell. has relieved temporarily the severe pains of glaucoma, though I have never seen any permanent benefit from its use. (Glaucomatous eyes are exceedingly sensitive to the action of this drug, and atropine should never be used in this disease).

It is often the remedy for *hyperæsthesia of the retina* dependent upon some anomaly in refraction, or due to reflex irritation.

In *hyperæmia of the optic nerve and retina* this remedy has been especially efficacious, particularly if dependent upon cerebral congestion and accompanied by aching pain in the eye, aggravated by any light; also, in chronic forms of hyperæmia, if a red conjunctival line is very marked along the line of fissure of the lids. In some of these cases, as well as in some acute inflammatory affections, retinal photopsies are present, such as red sparks, flames, bright spots, lights, etc.

Its usefulness is not, however, confined to simple congestion of the optic nerve and retina, as it is one of our chief remedies in inflammation of these tissues. The following cases will show the sphere of action in inflammation of the optic nerve and retina: Optic neuritis, in which the papilla was very much swollen, veins large, flashes of light before the eye and pains in the head. Bell.

cured speedily. Retinitis, occurring in a young lady who was subject to congestive headaches, always worse in the afternoon. The retina was very hazy and œdematous, appearing as if covered with a bluish-gray film; outlines of disc ill-defined; vessels large and tortuous. Under Bell.<sup>30</sup> a rapid disappearance of the above symptoms took place. Neuro-retinitis. Edith G., æt. 5, had suffered from "chills and fever," which had been relieved without quinine. Six weeks previous to my seeing her and immediately after the chills had been stopped, it was first noticed that her sight was poor, but variable; sometimes she seemed to be nearly blind, while again would distinguish medium-sized objects with comparative ease; complained very often of headache, especially every afternoon, when the head would be quite hot and the face flushed. She was more irritable and cross than formerly. The condition at the time was reported as follows: "Child has a full face, light complexion and red hair; is bright and smart. Her vision is very poor; does not seem to be able to count fingers, though, owing to her age, her statements are unreliable; sight is markedly better in right than left eye; nothing abnormal is to be seen externally, with the exception of a slight convergent strabismus in left eye. Ophthalmoscopic examination after dilatation of both pupils with Atropine. Right eye: Optic disc very much swollen and outlines ill-defined; its edges, as well as the surrounding retina, are so infiltrated that it is only by tracing the retinal vessels that the optic nerve entrance is discovered. The arteries are about normal in size, but they, as well as the veins, which are large and tortuous, are veiled here and there by the infiltration. In the macula lutea bright white patches are seen, of a triangular shape and extending more toward the nerve than outward from the macula (are somewhat similar to the stellated arrangement usually found in retinitis albuminurica). Left eye: The same swollen condition of the optic nerve and surrounding retina is perceived as in the right eye, though mingled with the infiltration into the retina are spots of exudation of an opaque character. The retinal vessels are enlarged, especially the veins, which are full and tortuous; they are hidden at points by the exudation into the retina; while along their course, especially on the nerve entrance and immediately around, small points of extravasation of blood are noticed. The changes in the macula lutea are similar to those in the right eye, though the

white patches are more marked and divided into many by fine lines or inter-spaces. A careful examination of the urine shows not the slightest trace of albumin.'<sup>1</sup> Bell.<sup>3</sup> was given. In three days vision was better. In two weeks no hæmorrhages were to be found in the retina, the swelling of optic papilla and retina were decidedly less and the headache was relieved. In one month the vision was very good, both nerves somewhat atrophic and the points of exudation in the retina could scarcely be distinguished, though no perceptible change could be seen in the white patches in the macula lutea.

Convulsive movements of the eyeball in the light, with terrible pressive pain extending through the whole head, ameliorated in a dark room, have been cured by Bell.; hence its use has been recommended in strabismus due to spasmodic action of the muscles, or when resulting from brain affections. In orbital neuralgia, especially of the infra-orbital nerve, with red face and hot hands, it is a valuable remedy.

Some cases of amaurosis and amblyopia will require this drug, especially if they are congestive in form and accompanied by the headache and other characteristic symptoms.

### BROMIUM.

Great depression of mind; pain deep in the crown of the head. Protruding eyes. A gray point before the right eye, moving up and down with movement of the eye. Particularly in blondes.

### BRYONIA.

**Objective.**—Puffiness of the right upper lid. The conjunctiva is dark-red and swollen, with some discharge of pus. Morning agglutination and frequent lachrymation.

**Subjective.**—Pressive pain above the left eye. Pressure from within outward over the left orbit into the brain, which changes to a pressure on the eyeball from above downward. Pain deep in the right orbit, aggravated by pressure upon the eyeball. Drawing together of the left upper lid, with a sensation of heaviness therein; aching pains in the eyes. Severe burning and lachrymation of the right eye. Eye very sore, and worse on moving. Headache in morning on opening eyes. Photophobia. Very *sensitive pressive* pain (coming and going) in the left eyeball, *especially*

*violent on moving the ball*, with a feeling as if the eye became smaller and retracted in the orbit.

**Vision.**—Dim vision; on reading, the letters seem to run together; *appearance of all colors of the rainbow*; every object seems covered with these colors.

**Clinical.**—It is found that Bryonia is rarely indicated in diseases affecting the external tissues of the eye, although in one case of acute inflammation of both the ocular and palpebral conjunctiva, worse in the left eye and toward the outer canthus, with marked *soreness to touch or upon any motion of the eyes* and with a sticking sensation as of hairs in the eyes, a speedy cure resulted under Bryonia.

Its great sphere of usefulness is, however, in diseases of the uveal tract, especially when of a rheumatic origin.

Favorable results frequently follow its use in *iritis* caused by a cold, especially in rheumatic subjects, in which there is *sharp, shooting pain through the eye into the head, aggravated by motion* and relieved by pressure; or if the pain is a steady aching in the posterior portion of the eye, extending through to the occiput, worse at night and on motion.

It is also often indicated if the inflammation has extended to the choroid, as was shown in a case of acute *irido-choroiditis* of the left eye in which there were present opacities in the vitreous, tremulous iris, great ciliary injection, pus in the anterior chamber, soreness in eyeball on moving it and darting pains from the eye through the head, with heaviness of the head afternoons. Bryonia speedily relieved.

In the serous variety of *choroiditis* it is an important remedy, as one would be led to suppose from its relation to serous inflammation in general. Experience has also verified its usefulness in this disease.

*Glaucoma* appears to have been checked in its progress by Bryonia when the eyeball has seemed too full, as if pressed out, with sharp, shooting pains in the eye and head, worse at night; also, in a case in the prodromal stage, in which the symptoms were as follows: The vision of the left eye had been failing three months, and especially for one week; there was heavy pain over the eye, worse at night; halo around the light for one day; cupping of the optic disc, and T+. The patient was rheumatic and



nervous. Under Bryonia<sup>30</sup> all the symptoms were relieved with the exception of the excavation of the nerve.

A case of hyperæmia of the optic nerve and retina was immediately relieved by this drug; a bluish haze appeared before the vision (vision  $\frac{2}{50}$ ); with severe pain over the eye as from a *needle going through the eye* and head (compelling her to go to bed); with heat through the whole head, aggravated by stooping.

*Ciliary neuralgia* often requires Bryonia, especially if the pains are sharp and severe, even making the patient scream out; the pains are aggravated by opening the eye and by any motion of the eyeball; the eyes must be kept closed and at rest. The pains, when this remedy is indicated, are usually *sharp in character, passing through the eye into the head, or from the eye downward into the malar region and thence backward to the occiput; the seat of pain becomes as sore as a boil, and the least exertion, talking, moving, or using the eyes, aggravates the trouble.* The following symptoms have been reported as cured by this drug, though not found in any proving; some have been repeatedly verified, and seem to direct the choice of the remedy; they are mostly variations of sensation in different persons, dependent upon the great characteristics of the remedy—aggravation on motion, and amelioration on pressure: Pressing, crushing pain in the eyes, worse on motion; soreness and aching of the eyes on moving them; scalding in the corners of the eyes, aggravated at night; dull pain and soreness, especially in the left eye, worse in the morning and relieved by pressure.

### CACTUS GRAND.

**Clinical.**—From its action on the heart, cases of exophthalmic goitre have been improved. Angell advises its use in hyperæmia of the eye, especially of the fundus.

### CALCAREA CARBONICA.

**Objective.**—Swelling and redness of the lids, with nightly agglutination; during the day the eyes are full of mucus, with a hot sensation, smarting pain and acrid lachrymation. Redness of the conjunctiva with photophobia. Lachrymation on writing, lids hard and swollen, with induration and dry scales.

**Subjective.**—Painful sensation as if a foreign body were in

the eye. Pressure and itching in the eyes, worse in the evening. Itching, burning and stitches, especially on the margins of the lids and in the inner canthi. Tearing headache over the eyes, with nausea. Sticking pains in the eyes.

**Vision.**—Only one side of objects visible, with dilated pupils. Dimness of the eyes after getting the head cold. Halo around the light. Flickering, sparks and black spots before the eyes.

**Clinical.**—The clinical record of this drug, in superficial inflammations of the eye, is very full.

It has been found especially curative in various forms of *blepharitis* occurring in unhealthy, "pot-bellied" children inclined to grow fat and who sweat profusely about the head; lids red, swollen and indurated; inflammation of the margins of the lids causing loss of the eye-lashes, with thick, purulent, excoriating discharge and burning, sticking pains; blepharitis with great itching in the lids.

Induration remaining after styes and tarsal tumors have disappeared under its use.

Simple inflammation of the conjunctiva may call for this remedy, as in the following instance of *acute conjunctivitis caused by bathing*: There was moderate redness and lachrymation; eyes felt hot and feverish, with a sensation as of sand in them. Acon.<sup>3</sup> failed to relieve; Calc.<sup>30</sup> cured quickly.

The discharges from the eye are often profuse and, therefore, this drug has been used with advantage in *purulent ophthalmia*, especially in that form found in new-born children, characterized by profuse yellowish-white discharges, great swelling of the lids and ulceration of the cornea.

Conjunctivitis trachomatosa, with pannus, much redness and lachrymation, caused from working in the wet, has been speedily relieved.

A marked illustration of the curative action of the drug in affections caused by working in water is shown by the following case: A boatman suffered for years from repeated attacks of sore eyes, *caused by getting wet and cold*. Pterygium developed and grew rapidly. Calc. c. speedily checked the progress of the disease, and when last seen the cornea had cleared and but little thickness remained in the internal canthus.—T. F. A.

Favorable results have followed the use of this preparation of

lime in various forms of *inflammation of the cornea caused from getting wet or aggravated in damp weather* (Rhus). It is, however, particularly in *scrofulous inflammation of the cornea and conjunctiva*, characterized by pustules and ulcers, that Calc. c. proves so beneficial. The following cases afford a good illustration of the prominent features of this drug: A man was attacked with phlyctenules on the conjunctiva, after a severe cold, caused by working at night washing carriages. There were severe, sharp, shooting pains from the eye up into the head, worse from two to three in the morning and ameliorated on closing the eyes. Sulph. failed to benefit, but Calc. c.<sup>30</sup> gave immediate relief.—Keratitis phlyctenularis, with much redness and photophobia; pain at night which wakes the child from sleep, with cold perspiration; was cured under Calc. c.<sup>30</sup>.—Keratitis pustulosa, with profuse lachrymation, excessive photophobia and sticking pains; lids closed, red and swollen, with painful itching in them; agglutination mornings; head scurfy; cervical glands swollen, also the upper lip; acrid discharge from the nose; eruptions that burn and itch; abdomen distended and hard; skin pale and flabby. After the administration of Calc. the above symptoms were promptly relieved and the eye restored. It will be observed that the photophobia and lachrymation are usually excessive, but cases sometimes occur in which they are absent or present only in a moderate degree, though the general indications lead us to prescribe this remedy. The pains are more commonly sharp or sticking in character (Sulph.), though they may vary greatly. Another form of ulceration of the cornea in which Calcareo is frequently indicated is when an ulcer or pustule appears in the centre of the cornea with more or less haziness of the corneal tissue around it, no vascularity of the cornea, very little or no ciliary injection, and a variable amount of photophobia and lachrymation. (Compare Puls. and Sil.)

It has seemed to hasten the absorption of the exudation into the cornea in interstitial keratitis, especially after the inflammatory symptoms have, in a measure, subsided. Benefit has also been derived from its use in opacities of the cornea resulting from various forms of keratitis. Dr. C. M. Thomas writes me: "I have lately treated three cases of transverse calcareous band of the cornea, in two of which a complete clearing of the cornea followed a six to twelve weeks' use of Calcareo carb., preceded by a number

of doses of Sulph. The third and least marked of the three resisted all treatment."

The following symptoms found in *asthenopia* have been verified: Pain in the eyes after using them, worse in damp weather and from warmth. Burning and cutting pains in the lids, especially on reading, or sticking pains in the eyes, with dull hearing. Dim vision after fine work, like a cloud before the eyes, objects run together, with desire to close the eyes. Red and green halo around the light.

The selection of Calcarea will, in the majority of cases, depend mainly upon the general condition (cachexia) of the patient, since the eye symptoms are very often too general to individualize the remedy. The reverse may be said of Euphrasia and other remedies exhibiting no general dyscrasia.

### CALCAREA HYPOPHOS.

**Clinical.**—The hypophosphite of lime has proved to be a remedy of the first importance in severe cases of *abscess or ulceration of the cornea*. It is especially adapted to those cases in which the patient is in a very low state of general health and does not seem to have vitality sufficient to resist the ulcerative process. We meet with this condition not infrequently in sloughing ulcers of the cornea, and also in that dangerous form of ulceration, the crescentic, in which, although it may not primarily be dependent upon a debilitated state of the general system, the health usually becomes impaired from the severity of the ulcerative process and blennorrhœa of the conjunctiva, which commonly accompanies this condition. In some of these cases pus will be found in the anterior chamber (hypopyon) or the iris will become inflamed and so increase the intensity of the symptoms.

### CALCAREA IODATA.

**Clinical.**—The provings of this preparation of calcium give no clue to its sphere of action in diseases of the eye. But it is found by clinical observation to be an important remedy in *scrofulous inflammations of the eyes and lids*, as in chronic cases of blepharitis, complicated with enlargement of the tonsils.

It is, however, of especial value in pustules and ulcers, particularly of the cornea, marked by great photophobia, acrid lachryma-



tion, sticking pains and spasm of the lids; upon forcing open the lids a stream of tears flows down the cheek; also in erysipelatous swelling of the lids, chiefly of the upper, which is shining and red (compare Rhus). The inflammation of the eye is always worse from the least cold, to which these cases are very susceptible. It is chiefly indicated in pale, fat subjects who sweat much about the head, with enlargement of the tonsils and cervical glands.

In several cases benefit seems to have been obtained from the use of iodide of calcium in checking the progress of both conical cornea and staphyloma; in one marked case of progressive staphyloma of the cornea, the sequela of trachoma and pannus, the bulging of the cornea was checked and the infiltration into its parenchyma absorbed under the use of Calc. iod.

### CALCAREA PHOSPHORICA.

Eyes red; capillary vessels visible in streaks from corners to cornea. Sensation of something in the eye; always felt if it is mentioned. Cannot read; light hurts, particularly candle-light. Glittering circles of light before the eyes.

**Clinical.**—Valuable results have been obtained from the use of Calc. phos. in *parenchymatous keratitis*, especially if occurring in patients of a scrofulous diathesis; in one case, in which the haziness of the left cornea had been present two weeks and had extended from above downward, the vision was almost wholly lost. On account of enlargement of the tonsils, Dr. C. C. Boyle prescribed Calc. phos.<sup>3</sup>, under which rapid improvement took place and six weeks later only a slight macula remained; vision  $\frac{20}{50}$ . The photophobia has been well marked in all cases of corneal inflammation successfully treated with Calc. phos.

In checking the progress of cataract, it has appeared to be of decided service. The range of usefulness of this drug in ophthalmic disorders is, no doubt, much more extended than here given, but further experience is necessary to demonstrate its proper sphere of action.

### CALCAREA PICRATA.

Dr. Sterling \* reports valuable results from the use of this drug

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\* Trans. Amer. Inst. of Homœo. for 1885.

in styes and phlyctenules of both the cornea and conjunctiva. He has aborted styes within twenty-four hours and in phlyctenular troubles has subdued them within forty-eight hours, especially where there has not been pronounced vascularity.

### CALCAREA SULPHURICA.

Has proven of value in some cases of phlyctenular and pustular keratitis, with a thick yellow discharge and accompanied by enlarged cervical glands.

### CALENDULA.

**Clinical.**—The most marked success which has attended the use of Calendula has been observed in injuries of the eye and its appendages, especially cut wounds.

After all operations upon the eye or lids, this drug is useful in preventing any undue amount of inflammation and in hastening recovery. Its action is not, however, limited to the prevention of inflammation, as it has been of service in various forms of traumatic inflammation of the eye.

Benefit has been derived from this drug in blennorrhœa of the lachrymal sac.

Only occasionally has this drug been used internally, its most marked results having been obtained from its local application. A solution of the tincture—from ten drops to two drachms to the ounce of water—may be employed, but a decoction, made from the leaves, is the best preparation which can be used upon the eye.

### CANNABIS SATIVA.

(Under this drug the symptoms of Cannabis indica will be included, but designated by \*, as the clinical application of the two remedies is apparently the same.)

**Objective.**—\*Injection of the vessels of the conjunctiva. \* *The vessels of the conjunctiva of both eyes are injected in a triangular patch extending from the internal canthus to the cornea; worse at night. The cornea becomes obscured.* \*Lachrymation.

**Subjective.**—\*Heat in the eyes Sensation of spasmodic drawing in the eye; as if sand were in the eyes. Pressure from behind the eye forward.

**Vision.**—\* While reading the letters run together. \* Twinkling, trembling and glimmering before the eyes. \* Sensitiveness of the eye to light.

**Clinical.**—Cannabis deserves to be employed more extensively in ophthalmic troubles than it has hitherto been, especially in affections of the cornea and conjunctiva. I would suggest its use in pterygium, though have not, at present writing, given it a trial.

The following case will illustrate its action in *pustular keratitis*: Colored man, æt. 28, duration of disease two days. There was a large pustule on the inner margin of the left cornea, with excessive injection of the conjunctival vessels, commencing in a broad base at the internal canthus and terminating in the pustule which forms the apex of a triangle, similar to a pterygium. He was entirely cured in three days under Cannabis ind.—A. WANSTALL.

Both varieties of Cannabis have been used with benefit in vascular conditions of the cornea. Some cases of pannus have yielded to its influence, though more valuable results have been obtained from its use in *parenchymatous keratitis*, as a case recently under treatment will illustrate: A boy, æt. 7, was brought to me on December 24th for treatment of an interstitial inflammation of the right cornea of two weeks' duration. The history of hereditary syphilis was fairly clear. Under Aurum.mur.<sup>3</sup> the eye was nearly well on January 20th, when the left eye became inflamed and continued to grow worse until March 2d, notwithstanding the use of Aurum, Con., Arsen., etc., internally, and the instillation of Atropine in the eye. On March 2d the *cornea was densely opaque and vascular*, so that the iris could not be seen through it. The epithelial layer was a little rough, but there was no superficial ulceration. There was *profuse lachrymation and intense photophobia*; the child not being able to open his eyes in any light. He complained of some pain. Cannabis sativa<sup>3</sup> had been given for four days with no relief; the tincture, ten drops in two-thirds of a glass of water, one teaspoonful every hour was prescribed. Immediate improvement followed its use and on March 8th the child could open the eye well, had no pain and the vascular infiltration into the cornea had diminished. The cornea continued to clear for a month or more, when, only a very moderate amount of haziness remaining, other remedies were given for other symptoms.

## CANTHARIS.

Inflammation of the eyes. Lachrymation. *Burning in the eyes and glowing heat as from coals.* Biting sensation as if salt were in them. Margins of lids pain on opening them.

**Clinical.**—Has proved efficacious in inflammations of the eye caused by burns, as in the case of a young man who had had a hot iron thrust into the eye, burning the conjunctiva and thus producing quite severe conjunctivitis, with burning pain in the eye. Cantharis quickly relieved the pain and cured. In another case, in which the cornea was inflamed as a result of a burn from fireworks, with some ciliary injection, great photophobia and moderate pain, a speedy cure was effected under Cantharis<sup>30</sup>, after Aconite and Atropine had failed to relieve.

## CARBO VEGETABILIS.

**Subjective.**—A heavy weight seemed to lie upon the eyes so that he must make a great exertion when reading or writing in order to distinguish letters. The muscles of the eye pain when looking up. Itching in the margin of the lids and about the eyes. Eyes become weak and ache from over work. Burning in eyes.

**Vision.**—He became short-sighted after exerting the eyes for some time. Black floating spots, flickering and rings before the eyes.

**Clinical.**—This drug has been too little employed in eye diseases and its clinical history is extremely scant.

From its symptomatology we are led to recommend its use in cases of myopia, accompanied by posterior staphyloma, in which it ought to relieve the unpleasant symptoms and prevent the increase of the staphyloma, though I do not imagine that it would in any degree diminish the amount of myopia.

In asthenopia, as the verified symptoms indicate, it has proved beneficial.

## CARBOLIC ACID.

Very severe orbital neuralgia over the right eye. Slight pain over the right eyebrow; the same kind of pain, but in a milder degree, under the right patella, both of short duration. Piercing



pain in a spot in left supra-orbital ridge. Swimming before the eyes.

**Clinical.**—In *conjunctivitis trachomatosa*, with or without pannus, remarkable success has often followed the use of Carbolic acid and glycerine as a local application. I have used it in the proportion of six drops to the ounce and in many cases it has acted much better than tannic acid or other astringents.

As indicated by the above verified symptomatology, it has proved of service in some cases of supra-orbital neuralgia.

### CAUSTICUM.

**Objective.**—Inflammation of the eyes, with burning and pressure in them and agglutination in the morning. Visible twitching of the lids and in the left eyebrow. Lachrymation even in a warm room, but worse in the open air. Pupils dilated.

**Subjective.**—Burning and stinging as with needles in the eyes, with dryness and photophobia, especially in the evening. *Pressure in the eyes as if sand were in them.* Pressive pain in the eye increased by touch. Biting and pressure in the eyes, which seem heavy, with redness of the lid. Itching of the eyes, especially in the lids; disappears on rubbing. *Inclination to close the eyes;* they close involuntarily. *Sensation of heaviness in the upper lid* as if he could not raise it easily, or as if it were agglutinated to the lower lid and could not be easily loosened. Opening of the lids is difficult. Itching on the lower lid and on its inner surface, with burning as soon as he touches the eye or moves it.

**Vision.**—Photophobia; constantly obliged to wink. Flickering before the eyes, as from swarms of insects. If he winks, he sees sparks of fire before the eyes, even on a bright day. The eyes become dim and the *vision indistinct*; it seems as though a thick cloud were before the eyes. Obscuration of the vision, as if a veil were drawn before them; transient obscuration on blowing the nose. Diplopia from paralysis of the muscles, worse on turning the eyes to the right.

**Clinical.**—It has been employed with benefit in some cases of *blepharitis* (especially if ameliorated in the fresh air—Liebold) and in certain forms of tumors of the lids, particularly warts on the lids and brow.

Simple acute *conjunctivitis*, with a *sensation of sand in the eye* and dull pain in the eyeball as if sore, has been relieved under Caust.<sup>200</sup> It is not, however, often the remedy for external inflammations of the eye, though as intercurrent, in scrofulous inflammations and trachoma with pannus, it has been of decided service, if called for according to indications in the above symptomatology.

The action of Caust. upon the lens is probably as pronounced as that of any remedy in our materia medica, and many *cases of cataract have been arrested in their progress* and even the sight improved, where before its administration they were rapidly going on to complete blindness.

The following case will illustrate its action: A man appeared for treatment with well-marked hard cataract, which was rapidly increasing. (Had been told by celebrated oculists of the old school that he would soon be blind and that he then could be operated upon.) He complained of the following symptoms: A sensation as if there was a substance in the eye too large, causing a kind of heaviness and distension, only in the evening; also a feeling as if there was something moving in the eyes in the evening; could not retain his urine and could not feel the urine passing through the urethra. Under the influence of Caust. the progress of the cataract was immediately checked, and one year afterward the vision was found somewhat improved, though the white striæ in the lens underwent no appreciable change. After seven years his vision remained fully as good as when he began treatment.—T. F. A. That this remedy has checked the progress of cataract and improved the vision has often been demonstrated to my satisfaction. It must not be supposed, however, that I believe cataract can be cured by internal medication, for I have never seen any change in the opaque striæ found in the lens, but only a clearing of the diffuse haziness which often accompanies this condition.

But its principal sphere of action is in *paralysis of the muscles*, and here it is the remedy "par excellence." It has been used more often with advantage in paralysis of the ciliary muscle, external rectus, levator palpebræ superioris, or orbicularis, though indicated in paralysis of any of the muscles, particularly if caused from exposure to cold. In cases of paralysis following diphtheria it has also been of service. Selected from a number of cures are

the following, which will serve to illustrate its action: A girl, eleven years of age, had complained of her vision gradually failing for near objects for a week; supposed to be due to a cold. V.  $\frac{20}{30}$  improved by + 24 to  $\frac{20}{20}$ . Could only read  $3\frac{1}{2}$  Snellen, at the distance of two or three feet, or with + 24 glasses. The eyes were perfectly normal, pupils not dilated and the action of the other muscles good. The diagnosis was paralysis of the accommodation in both eyes. Caust.<sup>200</sup> was prescribed. Three days later, when next seen, she had fully recovered the power of accommodation, and reported that two hours after first taking the medicine the vision began to improve, and on the next day she could read as well as ever.

For paralysis of the muscles brought on by getting wet, Rhus is more often called for than Caust., as the latter is especially indicated in those cases resulting from exposure to cold.

### CEANOTHUS AMERICANUS.

Dr. French reports in the *Trans. Amer. Inst. of Homœo.*, 1884, a case of glioma retinæ, in which he found curative action of the extract of red clover. After enucleation the microscope revealed the characteristic gliomatous cell formation. For four days after enucleation the stump discharged an ichorous, excoriating and sanguinolent fluid with the appearance of unhealthy granulations in the centre of the stump. The Ceanothus was applied locally and the fluid extract given internally. The character of the discharge was changed within twenty-four hours to healthy pus and so remained until the stump was healed. On the sixth day the child was profusely salivated, which disappeared upon stopping the drug. Two years had elapsed with no sign of recurrence of the disease and the child was in perfect physical health. Another case reported by G. S. N. will be found under Glioma Retinæ.

### CEDRON.

Pain across the eyes from temple to temple. *Severe shooting pain over the left eye.* Severe pain in the eyeball, radiating pains all around the eye, shooting into nose, scalding lachrymation.

**Clinical.**—The sphere of usefulness for Cedron, so far as experience has taught us, is confined to neuralgic affections of the

eye, particularly when involving the supra-orbital nerve; and in *supra-orbital neuralgia* so often found in iritis, choroiditis, etc., it is among the first remedies to be thought of. *The pains are usually severe, sharp and shooting*, starting from one point over the eye (more often over the left) and then extending along the branches of the supra-orbital nerve up into the head; in some cases the pains would come and go suddenly and would be worse in the evening or upon lying down, though these may not be characteristic.

### CHAMOMILLA.

**Objective.**—The eyelids are swollen in the morning and agglutinated with purulent mucus. Conjunctiva swollen and dark-red. Lachrymation. Intense photophobia. Inflammation from exposure to cold, damp atmosphere, worse by every cold change of weather. Profuse acrid discharge.

**Subjective.**—Burning and sensation of heat in the eyes; pressure in the eyes, which are inflamed and full of mucus in the morning. Violent pressure in the orbital region; sensation in the eyeball as if it were compressed from all sides, with momentary obscuration of vision. Stitches in the orbital region and soreness in the canthi.

**Clinical.**—Chamomilla is especially adapted to superficial inflammations of the eye occurring in children, being rarely, if ever, useful in diseases of the deeper tissues.

It is an excellent remedy in *ophthalmia neonatorum* characterized by the usual symptoms (even if the cornea has been attacked) if the child is very fretful and wants to be carried all the time. It should also be thought of in inflammations of the eye in which the congestion is so great that the discharges are bloody as well as purulent (Nux).

Cham. has proved very serviceable in *scrofulous ophthalmia* occurring in *cross, peevish children during dentition*, and it will often relieve the severity of the symptoms, even though it does not complete the cure. The symptoms which call for this drug are usually severe; the pustules and ulcers are chiefly situated on the cornea, and are attended with great intolerance of light, considerable redness and lachrymation.



### CHELIDONIUM MAJUS.

**Objective.**—Twitching and blinking of the lids. The white of the eye is of a dirty yellow color. Redness of the conjunctiva, especially of the lower lid. Lachrymation. Eyelids swollen and red. Redness and swelling of the margins of the lid. Hordeolum. Thick yellow discharge. Photophobia.

**Subjective.**—Tearing pain in and about the eyes. *Neuralgic pain above the right eye*, especially in the evening when reading by artificial light. Pressive pain above the left eye, which seems to press down the upper lid. *Aching or pain in the eyeballs on looking up* or moving the eyes. Sharp, piercing, sticking pains.

**Vision.**—Dimness of vision. A blinding spot seems to be before the eyes, and, if he looks at it, the eye waters. Blackness before the eyes, with a sensation of fainting.

**Clinical.**—At one time remarkable success was claimed to have followed the use of this drug in a variety of eye troubles, as inflammations, opacities of the cornea, intermittent ciliary neuralgia, etc., but later observations have failed to verify much of its vaunted success.

The pain in and over the eye upon looking up has occasionally led to its employment with favorable results; as for instance in a case of acute aggravation of chronic trachoma in which the right eye had been very red and inflamed for five days, with much pain all night and a hard, sharp pain on turning the eye upward. Under Chel.<sup>30</sup> the pain was at once relieved and the acute condition had entirely subsided in three days.

This remedy may be of service in affections of the muscles, as suggested by the following case: A lady (age 40) reported that her eyes had been growing weak for three days from no apparent cause. She complained of distant objects being blurred and that upon attempting to fixate an object, two were seen. Near vision was not affected. Examination showed decided weakness of the right external rectus muscle. Chel.<sup>200</sup> relieved all the symptoms in two days.—T. F. A.

### CHIMAPHILA UMBELLATA.

**Clinical.**—A large number of cases of pterygium have been treated by this drug, a few of which have been improved, while others have exhibited no good results from its use.

Dr. Bushrod James reports favorable results from the use of this remedy in checking the progress of incipient senile cataract.

### CHINA.

Motion of eyes painful, with sensation of mechanical hindrance. Lachrymation, with crawling pains in the eyes and in the inner surface of the lids. Dimness of vision. Neuralgia about the eyes. Yellow color before eyes. Photophobia. Pressure in eyes.

**Clinical.**—The clinical application of China in ophthalmic disorders has been varied according to the reports in our literature, though it is a remedy not often called for in ophthalmic therapeutics.

It is especially adapted to those diseases of the eye which are of a malarial origin, or in which the pains are of an intermittent type; also, to those affections in which there is impairment of tone from loss of vital fluids.

### CHININUM MURIATICUM.

**Clinical.**—This form of quinine, in appreciable doses, has been used with great success in controlling the severe *neuralgic pains occurring in iritis* and various other diseases of the eye. In some cases it does more than control pain, as it exercises a very beneficial influence over the progress of the disease. This is especially so if malaria complicates the trouble and the *pains are intense and intermittent in type*.

Favorable results have been observed from its use in trachoma with or without pannus.

In ulceration of the cornea it is of service if the iris has become involved and there is severe pain, either in the eye or above, periodic in character, especially if accompanied by chills. The intensity of the pains and their intermittent character will furnish our chief indications.

### CHININUM SULPHURICUM.

Disc and retina both very anæmic. Pupils dilated. Neuralgic twinges in the supra and infra-orbital nerves, generally periodic in character. Photophobia and lachrymation.

**Vision.**—Dimness of vision as from a net before the eyes and

as from a dark fog. Bright light and sparks before the eyes. Black spots before the eyes.

**Clinical.**—From the physiological action of quinine upon the eye, it should prove a valuable remedy in affections of the optic nerve and retina. It has not, however, been employed to any extent, although cases of optic neuritis are said to have been cured by its use.

An interesting case of intermittent strabismus, occurring in a child and continuing for some time (would squint one day and be entirely well on the next), was cured by the use of this remedy in the hands of an empiric.

### CHLORALUM.

**Clinical.**—The hydrate of chloral has a marked action upon the eye, in some persons producing injection of the conjunctiva, weakness of the eyes, paleness and congestion of the optic nerve, dimness of vision, etc. The clinical verifications of these symptoms have not, however, been made.

Dr. Buffum reports that he has cured with Chloral. hyd.<sup>6</sup> the following symptoms in asthenopia: “ Burning, smarting, itching; lids gummed in the morning; lids heavy, droop at night and after use; eyeballs feel too large; lids puffed; all symptoms brought on by use; eyes feel better in cool air.”

### CHRY SOPHANIC ACID.

**Clinical.**—This drug is of especial value in obstinate cases of *blepharitis ciliaris*, especially in scrofulous, poorly nourished children, with pustules or eczematous eruption about the eyes. In phlyctenular keratitis and conjunctivitis when but little pain, photophobia or lachrymation with eczematous eruption of the face. May be used locally as an unguentum, eight grains to the ounce of vaseline, at the same time it is given internally.

### CICUTA VIROSA.

**Objective.**—Eyes staring. Pupils dilated and insensible. Pupils first contracted then dilated. Eyes sensitive to light. Trembling and twitching of lids.

**Vision.**—When she attempts to stand she wishes to hold on to something, because objects seem now to come nearer, and now to recede from her. Objects seem double (and black).

**Clinical.**—It is in spasmodic affections of the eye and its appendages that this remedy is especially indicated. Thus we find it very valuable in strabismus, particularly if periodic and spasmodic in character; many cases of which have been cured (this, of course, excludes that form of periodic squint dependent upon an anomaly of refraction). Strabismus occurring after a fall or blow, has been relieved.

### CIMICIFUGA.

**Subjective.**—Eyes congested during headache. Pain over the eyes, extending from them to the top of the head. Pain over the left eye, extending along the base of the brain to the occiput. Pain in the centre of the eyeballs, and also sensation as if pain were situated between the eyeball and orbital plate of the frontal bone, worse in the morning. Dull pain in occiput. *Aching pain in both eyeballs.* Black specks before the eyes.

Sensation of swelling or heaviness of the eyelids. Dilatation of the pupil.

**Clinical.**—Cimicifuga is not often required if there has been much tissue change, unless it be to control the pains which arise in the course of the disease, as for instance in occasional cases of ulceration of the cornea in which the pains are sharp, extending through the eye into the head.

It may be indicated in asthenopic troubles, as in a case of accommodative asthenopia in a myope of one-sixth, with aching in the eyeballs and shooting pains back into the head, aggravated at the menstrual periods. Cured by Cimicif.—J. H. BUFFUM.

In certain forms of ciliary neuralgia its value has been frequently demonstrated. It is indicated by aching pains in the eyeball or in the temples extending to the eyes so severe, especially at night, that in some instances it seems as if the patient would go crazy; also if the pains are sharp or shooting, extending either from the occiput through to the eyes, from the eyes to the occiput or from the eyes to the top of the head; these pains are generally worse on the right side, in the afternoon and at night, and are ameliorated on lying down.

*Macrotin*, a resinoid from Cimicifuga, has often been employed in place of the whole drug, especially in ciliary neuralgia. Its action upon the eye is very similar to Cimicifuga, and, by some,



it is usually given in preference to the latter. Angell highly recommends it for hyperæsthesia of the retina.

### CINA.

Pulsation of the superciliary muscles; a kind of convulsion. A slow stitch extending from above the upper orbital margin deep into the brain. Pupils dilated.

On rising from the bed all becomes black before the eyes, with dizziness in the head and faintness; he totters to and fro, relieved on lying down. Yellow vision. Optical illusions in bright colors.

**Clinical.**—Cina or Santonine may be of service in strabismus or other ophthalmic disorders depending upon helminthiasis, if the child has a pale, sickly look, with blue rings around the eyes, pain about the umbilicus, boring of the nose, etc. In scrofulous keratitis, in feverish, fretful children, who cry out in sleep.

Santonine has been used with favorable results in asthenopia caused by anomalies in refraction. The second decimal potency was employed.—W. H. WOODYATT.

### CINNABARIS.

**Subjective.**—Inflammation of the eye. Aching soreness of the eyes, worse in the evening. *Pain from inner canthus of left eye across eyebrows.* Weakness and sleepiness in the eyes about noon; could scarcely keep them open. *Drawing sensation from right inner canthus across the malar bone to the ear.* Shooting pains in inner canthus of right eye, with a burning and itching. *Pain from right lachrymal duct around the eye to the temple.*

**Clinical.**—This form of mercury is an important remedy in ophthalmic therapeutics, and the indications for its use are generally very clear.

In various forms of *blepharitis*, *conjunctivitis* and *keratitis*, even when severe ulceration of the cornea has occurred, it has proved especially serviceable, if accompanied by that characteristic symptom of *pain above the eye, extending from the internal to the external canthus, or a pain which runs around the eye, usually above but sometimes below*; this pain may vary greatly in intensity and character, being sometimes sharp, stinging or stitching, at other times dull or aching, and may extend into the eye or up into the head. The photophobia and lachrymation are usually very

marked as well as the redness. The lids frequently feel so heavy that it is with difficulty they are kept open, especially in the evening.

Keratitis parenchymatosa and scleritis, in which there has been more or less pain over the eye, have been benefited by Cinnabar.

In *iritis and kerato-iritis* it is often called for, especially in the syphilitic variety and if gummata are present in the iris. The chief indication will be found in the characteristic pain over the eye, although, in addition to this, there may be shooting pains through the eye into the head, or soreness along the course of the supra-orbital nerve and corresponding side of the head. *The pains are worse at night*, usually in the evening, though in one case the aggravation was from one to three in the morning.

*Asthenopia*, with pain extending from the inner canthus around the eye and soreness over the exit of the supra-orbital nerve, worse in the morning; also with pain around the right eye, aggravated in the evening and upon using the eyes; has been relieved by this remedy.

Cinnabar is a very valuable remedy in certain forms of ciliary neuralgia, as indicated by the symptoms already mentioned. The pains are not sharp and lancinating, radiating from one point in various directions as in *Spigelia*, neither do they follow the course of the supra-orbital nerve as do the pains of *Cedron*. *Kali bichrom.* has a similar pain, on the left side.

### CLEMATIS.

Inflammation of the white of the eye with lachrymation. Pain in the eye. Burning in the eyes as if fire were streaming out of them, with sensation of dryness. Eyes red, glittering, hot and dry. Much smarting of the eyes. Photophobia.

**Clinical.**—This remedy has been most useful in *iritis or kerato-iritis*, in which there has been much dryness and burning heat in the eyes with great sensitiveness to cold air, light or bathing.

### COCCULUS INDICUS.

Eyelids inflamed. Redness of the sclerotic and haziness of the cornea. Pressive pains in the eyes; lids feel difficult to open. Can only see the left half of the line in reading. Useful in headaches due to asthenopia. Throbbing in vertex, aggravated on motion of the eyes. Pressive headaches in forehead.

### COLCHICUM.

Inflammation of the eyes. Violent tearing pains in eyes. Lids in constant motion. Eyes red and watery, worse in open air. In rheumatic affections of the eye. Intense neuralgic headaches.

### COLOCYNTHIS.

Painful pressure in the eyeballs, especially on stooping. Pain in the eyes; a sharp cutting in the right eye-ball. Inflammation of the eye.

**Clinical.**—It is chiefly serviceable in controlling the pains of iritis and glaucoma, with severe burning, sticking or cutting, extending from the eye up into the head and around the eye; or else an aching pain going back into the head, usually worse on rest at night and on stooping and *ameliorated by firm pressure* and walking in a warm room; a sensation on stooping as if the eye would fall out is also sometimes present. The lachrymation is profuse. Dr. Linnell\* reports a case of irido-choroiditis serosa which was at least aggravated, if not primarily caused, by the use of a Colocynth hair wash.

### COMOCLADIA.

The eyes feel very heavy, larger than usual, painful and pressing out of the head, as if something were pressing on top of the eyeballs, moving them downward and outward. *Right eye very painful, feeling much larger and more protruded than the left.* The eyes feel more painful when near the warm stove. Right eyeball very sore, worse on moving the eye. Eyeballs feel worse on moving them.

**Clinical.**—Ciliary neuralgia, from asthenopia, iritis and a variety of ocular diseases, have been relieved by Comocladia when indicated by the above symptoms.

### CONIUM MACULATUM.

**Objective.**—White of the eye yellow. Affected with a weakness and dazzling of the eyes, together with a giddiness and

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\* No. Amer. Journ. Homœo., 1887.

debility of the whole body, especially the muscles of the arms and legs, so that on attempting to walk one staggers like a person who had drunk too much liquor. Partially paralyzed condition of the external muscles of the eye; he could hardly raise the eyelids, which seemed pressed down by a heavy weight and was disposed to fall off to sleep. Pupils dilated and sluggish. Lachrymation. Intense photophobia with but little redness of the eye.

**Subjective.**—Pressure in the eyes while reading. Burning in the eyes and on the inner surface of the lids. Aching pain across the eyebrows and mistiness of vision. Itching and pricking in the inner canthus. Smarting in the inner canthus as if something corrosive had got into the eye.

**Vision.**—Weakness of vision. Double vision. *Sluggishness of accommodation*; vision good for fixed objects, but when an object is put in motion before the eyes there is a haze and dimness of vision producing vertigo.

**Clinical.**—In superficial inflammations of the eye Conium is a remedy of the first importance; but when the deeper structures have become invaded, not as much benefit has been derived from its use.

Indurations of the lids have been removed and ptosis has been benefited by Conium.

It is, however, in inflammatory conditions of the cornea (ulcers and pustules) that this remedy is chiefly useful, especially if the *inflammation is superficial, involving only the epithelial layers* and caused either from an injury, cold or scrofulous diathesis, the latter of which is most frequently the case. The indications for its use are generally very clear and well marked; thus, the *photophobia*, which is the most prominent symptom, *is excessive*, so that it is with great difficulty that we are enabled to open the spasmodically closed lids, and when they are opened a profuse flow of hot tears takes place (Rhus). Upon examination of the eye we usually find *very slight or no redness*, not sufficient to account for the great photophobia, which is out of all proportion to the amount of trouble. The discharge of mucus or pus is rarely profuse, but intimately mixed with tears. The pains vary greatly, but are generally worse at night (eye aches on lying down to sleep) and in any light; relieved in a dark room and sometimes by pressure.



Hence it appears that Conium is chiefly adapted to those cases in which the nerves are in a state of hyperæsthesia or when only the terminal filaments are exposed by superficial abrasion of the epithelial layer.

Hyperæsthesia of the retina frequently calls for this drug. The following instructive case, in which hyperæsthesia of the retina was a prominent symptom, came under my care about three years ago: Jessie H., æt. 20, had been subject to severe headaches, often with nausea, all her life. Seven weeks previous to my seeing her, upon waking in the morning, she found she could see only dimly, with great photophobia and loss of color perception. She had been perfectly well (no headache or pain in the eyes) the day before and interested in obtaining a situation which she desired. This condition of the eyes continued, without change, until I saw her, although she had suffered from a mild attack of pneumonia during the interval. There was some leucorrhœa, but no other uterine symptoms. Upon examination found *photophobia so intense that she could not open the eyes*, even in a moderately darkened room, without the aid of blue glasses. She could not see print of any size, not even No. 200, Snellen, though could count fingers at twenty feet. *All colors appeared white*. External and internal examination of the eyes revealed nothing abnormal. There was constant headache in the forehead, somewhat in occiput, worse after 4 P. M. and in the morning, relieved by tying the head up. Conium was given. Upon the next day, when in church, she was attacked with intense pain in both eyes, followed by headache, after which she could distinguish colors. Ten days later the sensitiveness to light had nearly disappeared, the headaches had been relieved and her perception of colors was good. Vision  $\frac{18}{200}$ , but with convex 40 vision  $\frac{20}{20}$ . Could not read without glasses, but with convex 60 could read at usual distance. Under the use of *Ruta grav.*<sup>2</sup> for about six weeks, both near and distant vision became perfect without glasses (vision  $\frac{20}{20}$ ).

By reference to the symptomatology, it will be seen that it must be an important remedy in paralysis of the muscles, especially weakness of the accommodation, in which it has often been of great service.

### CROCUS SATIVUS.

**Objective.**—Visible twitching of the lids, with a sensation as if

something must be wiped from the right eye. Inclined to press the eyes tightly together from time to time. Pupils dilated. Excessive photophobia and lachrymation.

**Subjective.**—Sensation of soreness in the lids. Feeling in the eyes as though he had wept very violently. After reading a while (even during the day) the eyes pain, with a sore burning and some dimness, so that he was frequently obliged to wink. Feeling as of biting smoke in the eyes. Feeling as though water were constantly coming into the eyes, only in the room, not in the open air.

**Vision.**—The light seems dimmer than usual, as if a veil were between the eyes and the light; is frequently obliged to wink and wipe his eyes, as though a film of mucus were over them. Sudden flashes before the eyes like electric sparks.

**Clinical.**—The use of Crocus has been chiefly limited to the relief of individual symptoms, arising in the course of various diseases, as indicated by the verified symptomatology.

The chief benefit has been observed from its use in asthenopic troubles, in which the above symptoms are especially found.

The feeling in the eyes as from violent weeping, especially if complicated with the sensation as if something were alive in the abdomen, is well marked and has been relieved by Crocus.

The following clinical symptoms have also disappeared under the use of this drug: Pain in the eye to the top of the head (Cimicif., Lach.). Pain in the left eye darting to the right. A sensation of cold wind blowing across the eyes (Fluoric acid). Constant winking with suffusion of the eyes in tears.—J. T. O'CONNOR.

### CROTALUS HORRIDUS.

Yellow color of the eyes. Blood exudes from the eye. Pressure and oppression above the eyes. Blue rings around the eyes. Burning and redness of the eyes, with lachrymation.

**Clinical.**—The chief sphere of action for Crotalus, in common with the other snake poisons, as suggested by Dr. C. Th. Liebold, is to be found in *intra-ocular hæmorrhages*. It has appeared to hasten the absorption of extravasations into the vitreous, though more favorable results have been obtained from its use in *retinal hæmorrhages*. It has been of service in the extravasations into

the retina dependent upon various forms of retinitis, but it is especially adapted to those cases which result from a degeneration of the vessels and are non-inflammatory in origin, in which it is more frequently indicated than Lachesis. This latter is, however, very similar to *Crotalus* in its action upon intra-ocular hæmorrhages, and general indications must decide between the two.

### CROTON TIGLIUM.

Inflammatory redness of the conjunctiva. Copious lachrymation.

Violent pains in the eye. *Tensive pain above the right orbit.* Lids œdematous. Stinging in eyeball. Sensation as of a string pulling eyeball back into head.

**Clinical.**—*Croton tig.* may be called for in *pustular eruptions upon the lids*, either with or without corneal or conjunctival complications, especially if accompanied by vesicular eruptions upon the face or head. (Ant. crud., if pustules are confined to the margins of lids.)

That it is an important remedy in herpes zoster ophthalmicus was illustrated in the case of a child in which a vesicular eruption, with much redness of the surrounding integument, appeared along the course of the nerve on the right side of the forehead after very severe pain. The pain continued after the appearance of the eruption and was so violent the child could not sleep at night. Some of the vesicles were filled with pus. *Crot. tig.*<sup>30</sup> gave immediate relief, after *Rhus*<sup>30</sup> had proved of no avail.

In phlyctenular keratitis and conjunctivitis it has been employed with benefit, especially if associated with the characteristic eruption upon the face and lids; the eyes and face feel hot and burning, the photophobia is marked and ciliary injection deep, with considerable pain in and around the eye, usually worse at night.

### CUNDURANGO.

**Clinical.**—This drug has been very useful in superficial ulceration of the cornea, with varying amount of redness, photophobia and pain, if accompanied by sores or cracking of the corners of the mouth.

**CUPRUM ACETICUM.**

**Clinical.**—The acetate of copper has proved beneficial in insufficiency of the external recti muscles.—J. H. BUFFUM.

**CUPRUM ALUMINATUM.**

(The preparation of aluminate of copper most commonly employed is the so-called "Lapis divinus," which is composed of equal parts of sulphate of copper, nitrate of potass. and alum.)

**Clinical.**—The aluminate of copper has been successfully used to a great extent in trachoma, to which condition it seems especially adapted. The results obtained are usually more satisfactory than those found from the sulphate of copper, which is the main reliance of the old school in the treatment of this disorder. It is used by application of the crystals to the granulations, at the same time giving the remedy in the potencies internally. Cuprum al. has been of service in conjunctivitis pustulosa with inflammation of the lids, though it cannot be often indicated in this affection.

Benefit has been derived from its use as a local application to opacities of the cornea. Its irritative action serves to stimulate the absorption of the new cells in the cornea which result from inflammation.

**CUPRUM SULPHURICUM.**

**Clinical.**—The sulphate of copper is one of the most efficient local applications employed by the old school in many superficial troubles of the eye, chief among which may be mentioned granular lids, although it has also proved beneficial in both catarrhal and purulent conjunctivitis.

**CYCLAMEN.**

Swelling of upper lids, with a sense of dryness and pressure. Flickering of light and various colors before the eyes. Burning in the eyes. Double vision from a squint dependent upon helminthiasis. Disturbances of vision that seem to be associated with indigestion, or uterine irregularities.

**DIGITALIS.**

Pupils dilated. Objects seem green or yellow. In the evening



while walking it seemed as though the upper part of the field of vision was covered by a dark cloud. Margins of the lids red, swollen and agglutinated in the morning. Slight photophobia.

**Clinical.**—This remedy is reported to have been beneficial in some cases of superficial inflammation of the eye, but I have never had occasion to confirm its usefulness in ophthalmic inflammation.

Some benefit has seemed to follow the use of Digitalis in detachment of the retina, especially in relieving such disagreeable symptoms as wavering before the eyes and the appearance as if everything were green.

### DUBOISIA.

(The sulphate of Duboisin is more commonly used than the whole plant, Duboisia, but as the two are so similar in action, both will be considered under the above heading.)

**Objective.**—Lids slightly œdematous. Agglutination of lids in the morning. Dilatation of the pupil. *Vessels of the optic disc much enlarged and tortuous*, so as to be easily visible. *Disc red and outline indistinct. Retinal veins dilated and tortuous.* Retinal arteries diminished. *Fundus of the eye generally very hyperæmic.*

**Subjective.**—Eyes hot and dry. Eyes feel tired as if overworked. *Pain in eyeball, just beneath brow. Sharp pain in the upper part of the eyeball.*

**Vision.**—Complete *paralysis of the accommodation*; could not read at any distance and could not look at food while eating, on account of pain. Can read better and the print looks blacker at double the usual distance. Paralysis of the accommodation takes place before dilatation of the pupil and continues after the latter has recovered.

**Clinical.**—From a very valuable paper upon the clinical and physiological action of Duboisin, by Dr. Charles Deady, in the *Trans. of the Am. Hom. Oph. and Otol. Soc.*, 1880, the following conclusions upon its usefulness in diseases of the cornea and conjunctiva are cited: "The results obtained in the cases of ulcer of the cornea, in which it has been used, are sufficiently good to warrant a trial in cases which prove intractable under other remedies. So far as we have been able to observe it seems to be adapted to a slow form of ulcer, more or less deep and *without* severe photophobia and lachrymation; in cases of superficial

ulceration, or in which much photophobia was present, we have thus far obtained no benefit from its use.

"The drug has been successfully used in several cases of *chronic hyperæmia of the palpebral conjunctiva*, involving to some extent the border of the lids. The symptoms calling for its use in this condition strongly resemble those of Aconite, viz., bright redness of the papebral conjunctiva, with heat and dryness of the eye. The difference between the two drugs consists in the fact that the hyperæmia which Duboisin cures is a *chronic affection*, such as is found in hyperopes and which is not always relieved by the use of glasses."

In diseases of the fundus, especially of the optic nerve and retina, Duboisin has proved, as might be expected, an important remedy. It is of the utmost value in *hyperæmia of the retina associated with weakness of the accommodation*.

In *optic neuritis* and retinitis Duboisin is, no doubt, often indicated, for several cases have yielded promptly to its influence, as the following will illustrate: A man, æt. 42, had suffered from attacks of vertigo for three months. There was a history of syphilis twenty years and of a blow on the head seventeen years before. When first seen he complained of sleeplessness day and night, severe headache from the back of the neck over the head to the eyes, worse at night, and eyes painful as if the balls were being pressed into the head. V.  $\frac{2}{4}$  o. u. with difficulty. The ophthalmoscope revealed a typical picture of "engorged papilla" in each eye, marked enlargement of vessels on the disc and extravasations on the right optic papilla and in the retina immediately around it. Bell<sup>3</sup> was given for ten days with slight change in the symptoms except that hæmorrhages were found on both discs, pain above the eyes with constant aching in them and heavy pressure on the vertex, worse in the morning. Within two weeks under Duboisin<sup>3</sup> the pain in the head had been relieved, the hæmorrhages in the nerves and retina had disappeared, and the inflammation was decidedly less. V.  $\frac{2}{3}$  o. u. There were one or two slight aggravations after this, but not important, when the patient was lost sight of.

*True weakness of the accommodation* may call for this remedy, as already suggested by the symptomatology (compare Ruta, Con., Arg. nitr.). I use the term "true weakness," for I believe

many of the so-called cases of asthenopia are dependent upon an "irritable weakness" of the accommodation, which is controlled by Jaborandi or one of that class of drugs.

### ELECTRICITY AND GALVANISM.

**Clinical.**—The sphere of electricity in eye diseases, while at present limited, is, we think, capable of much further extension. The reason of this limitation, we believe, lies in the fact that the oculist too little understands the true principles of electricity to try it in diseases where it might be serviceable, while the electrotherapist, not having the sufficient number of eye cases necessary to form scientific data, has not the opportunity to give this agency the thorough trial it should receive in order to demonstrate its true value in ocular diseases.

Commencing with the eyelids, we find electrolysis of the utmost value in the very annoying and obstinate condition of *trichiasis*. Epilation gives but temporary relief of the condition and has to be frequently repeated. Plastic operations are not always successful and only usually made when there is complete incurvation of all the lashes. In those partial cases of trichiasis, when only a part of the hairs turn in, electrolysis is the ideal treatment.

The use of electrolysis in trichiasis was first suggested by Michel, of St. Louis.

It is best to use a triangular platinum or gold needle, which is to be inserted into the hair follicle and then connected with the negative pole of an eight to twenty cell battery, while the positive pole is applied to the temple. Minute bubbles of gas appear around the needle and the tissue whitens when the circuit is closed. The current should be continued for about a minute or until the hair can be removed without resistance. When properly applied the hair bulb is destroyed and the hair will not grow again.

*Angiomata* or vascular tumors of the lid or orbit are also better removed by electrolysis than by any other method or operation. When the growth is small the negative pole may be applied by a sponge to the temple, but if large both poles should be attached to platinum needles two or three inches in length, which are then to be inserted into the tumor. The positive needle should remain in one position while the negative may be inserted at different points for a few minutes at a time. The first sitting should be

brief and careful notice taken of the reaction, as sometimes a too severe inflammatory reaction occurs. Other growths, even epithelioma, have been destroyed by electrolysis.

*Blepharospasm* has been successfully treated by galvanism. In this it is best to apply the positive pole behind the mastoid and the negative on the eyelid.

In *strictures of the lachrymal duct*, electrolysis has been especially advocated by some. We have used it in a great many cases with universally good results; it seems, however, to be particularly adapted to chronic strictures associated with blenorrhœa of the sac. The beneficial results are evidenced by an improvement in the blenorrhœa as well as in the stricture itself. My method of using electrolysis in these cases is to insert the ordinary lachrymal probe in the usual way until it comes in contact with the stricture, then attach the upper end of the probe to the negative pole, holding the positive on the temple; make gradual pressure until the stricture yields. The electrolysis, repeated at four or five sittings, is usually sufficient to keep the passage permanently opened.

*Granular and Follicular Conjunctivitis*.—I have seen cases of true trachoma very materially benefited by the use of electricity, while in follicular conjunctivitis I believe all cases that followed the treatment at all regularly were wholly relieved. The cases of trachoma were treated with the double electrode applied directly to the conjunctiva after the use of cocaine. The follicular cases were treated by puncturing the follicles, which renders the course of such a treatment necessarily long and tedious.

George Lindsay Johnson, of London, describes in the *Archives of Ophthalmology*, vol. xix., a new method of operating upon cases of trachoma by electrolysis and claims for it very favorable results. His plan is to make incisions parallel to the free border of the lid through the whole breadth of the conjunctiva by means of a three-bladed scalpel, the depth of the incision to be regulated by the swelling or thickening of the conjunctiva. The electrolyzer, made of two platinum blades, is then drawn slowly along the furrows made by the scalpel, all the grooves being taken in turn. He says the best results are obtained by using a current of about thirty milliampères and cautions against using a stronger current.

In diseases of the cornea we find at present only a limited sphere for the use of electricity. The galvanic current has a favorable



effect in the rare disease of *neuro-paralytic keratitis*, and as other treatment has proven of but little value in this affection, its use should always be tried. In *corneal ulcers*, especially of the serpiginous and crescentic varieties, the use of the galvano-cautery has proven of great value. Its use in this disease is to destroy the septic material lining the base and sides of the ulcer. In using it the galvano-cautery loop is brought to a red heat and, with the lids opened and the eye steadied with the left hand, the red hot loop is applied directly to the zone of propagation. The eye, previously cocainized, suffers no pain. The resulting eschar is thrown off in about twenty-four hours and the cornea heals with a less dense macula than under any other mode of treatment. Care should be taken that the patient does not see the cautery before it is applied, as the knowledge that a red hot wire is to be applied to the eye is not generally conducive to steadiness of the eye. By continuing the application of the loop a moment longer the floor of the ulcer can be perforated when desirable and the hypopyon evacuated.

In *exophthalmic goitre* cases that seem well authenticated have been reported cured by galvanization of the sympathetic.

The use of the electro-magnet in removing particles of iron and steel from the eye has been very generally adopted by oculists and many successful cases have been reported.

The results as to vision are always far more favorable if used very soon after the injury. Various magnets have been used for this purpose, that of Hubbell being perhaps the best on account of its size, shape and power. If the particle has penetrated into the interior of the eye, as for example the vitreous, and the wound is still open, it should first be made somewhat larger, so that the foreign body will not be scraped off from the magnet when it is withdrawn. The needle of the magnet is then to be inserted into the wound and as near as possible to the foreign body, which can sometimes be located by the ophthalmoscope. In this way particles of steel weighing twenty milligrammes have been removed from the vitreous and the eye recover with perfect central vision.

In *muscular* troubles of the eye, we find, however, perhaps the most extended and general use of electricity. Cases of paralysis, both complete and partial, of all the ocular muscles, have been restored by this agency. It is usually applied by placing one

electrode (some say the positive and others the negative) over the affected muscle, while the other is placed upon the brow or at the back of the neck; it should be applied regularly every day or two and from one to three minutes at each sitting. The current should be constant at first and then interrupted a few times at each application. It should also be used as strong as possible without causing too much discomfort.

In cases of muscular insufficiencies where we are trying to restore power to the weakened muscle by the systematic exercise with prisms, it is our universal rule to apply electricity for a minute or two after each treatment and to this use of electricity we attribute much credit in the restoration of the muscle power. It certainly leaves a very grateful sensation to the eye when gently used and often the patient states that the eyes feel rested and stronger after its use. It has been and is claimed by some that electricity gives beneficial results in various diseases of the lens, choroid, retina, optic nerve, etc., but with these the writer has had no experience and finds no sufficiently accurate evidence to warrant a favorable opinion of its use.

The static electricity has been used of late in muscular troubles with even more benefit than galvanism. It seems to relieve the asthenopic symptoms in some cases in a remarkable manner.

### ESERINE.

No proving of Eserine, an alkaloid of Calabar bean, has been made, but it is very extensively employed in ophthalmic practice. In the *Medical Analectic*, October, 1887, we find recorded a poisoning from a solution of gr. j to 3j. About one-half hour after the instillation of one drop of this solution in the eye severe clonic spasms of the eyelids set in; a quarter of an hour later spasmodic stiffness of the lips, especially the upper, set in, and soon the same sensation under the jaw on the left side. Within an hour there was a feeling of tremor or spasm in the arms or thighs and at the same time a sensation of pressure on the eyeballs and of weight and pressure within the head. Mental confusion and memory impaired; slept uneasily, waking often; pupils contracted to a pin point and conjunctiva injected. The action of Eserine upon the ciliary muscle is to stimulate its contraction and diminish the range of accommodation. It is, therefore, homœo-

pathic in spasm of the accommodation. It has also proven of value clinically in ulcerations of the cornea.

Laqueur,\* of Strassburg, first recommended the instillations of Eserine in the treatment of glaucoma. Since then it has been used by most oculists with varying success. There is no doubt that in some cases it may relieve the intra-ocular tension temporarily, if not permanently, and should, therefore, always be given a few hours' trial, at least in every case of glaucoma. Its action is chiefly, if not wholly, mechanical. By acting upon the muscular tissue of the vessels it causes a contraction in their calibre, or, as is more probable, by drawing away the iris from the angle of the anterior chamber the filtration passages are opened and so excretion accelerated.

Eserine has been recommended by prominent specialists of the old school for a variety of ocular diseases, as conjunctivitis purulenta; keratitis, especially suppurative; kerato-conus; asthenopia, muscular and accommodative. Harlan† reports eighteen cases of corneal ulcers after injury, all of which were cured with Eserine. It is being recommended now in much weaker solutions than formerly,  $\frac{1}{1000}$  or even  $\frac{1}{4000}$  being considered strong enough by some. Personally we have seen perfect contraction after cataract extraction without iridectomy from a  $\frac{1}{10000}$  solution.

### EUPATORIUM PERFOLIATUM.

Soreness of the eyeballs. Redness of margins of lids. Great aversion to light.

**Clinical.**—As an intercurrent remedy in various affections in which excessive soreness of the eyeballs has been a prominent symptom, this drug has been very useful.

### EUPHRASIA.

**Objective.**—*Redness and swelling of the margins of the lids, with at times an itching burning in them and increased watery discharge. Margins of lids red, with dry sensation. The lids are swollen and red. Injection of conjunctival vessels. Lachrymation profuse; tears acrid and burning. Excessive photophobia.*

\*Archiv. für Ophthalmologie, xxiii., 3.

†Med. Rec., June 23, 1888.

**Subjective.**—Burning and pressure in the eyes, with much lachrymation. Burning, biting in the eyes, obliging frequent winking. Itching of the eyes on going out, obliging frequent winking and wiping of the eyes, with increased lachrymation in the afternoon. Burning in the margins of the lids, with distressing sensation of dryness. The lids are sensitive and swollen. *Feeling as though the cornea was covered with much mucus; it obscures his vision and obliges him to frequently close and press the lids together.* Vision somewhat dim, as through a veil, in the evening. Eyes sensitive to candle-light.

**Clinical.**—The indiscriminate use of Euphrasia in all cases of ophthalmia, as prescribed by many practitioners, is not to be imitated, for although it is a remedy of great importance, especially in superficial diseases of the eye, still its sphere of action is well defined.

The results of many cases have proved its value in *blepharitis*. When indicated, the lids will be found red, swollen and covered with a *thick, yellow, acrid discharge, together with profuse acrid burning lachrymation, which makes the lids and cheek sore and excoriated*; firm agglutination of the lids in the morning is also present and fluent coryza often accompanies the eye symptoms.

The cases of *catarrhal and strumous inflammation of the cornea and conjunctiva*, which speedily respond to this drug, are to be counted by scores, for it is in these that Euphrasia is especially efficacious. It is useful in both the chronic and acute form of inflammation, but especially in the latter, as follows: Catarrhal inflammation from exposure to cold; catarrhal inflammation of the eyes and nose in the first stage of measles; papillary trachoma with or without pannus; pustules on the cornea and conjunctiva; superficial ulceration of the cornea (sometimes accompanied with pannus), though is rarely indicated in the deep form, except, perhaps, as a palliative in the first stage. In all the above cases we usually find much photophobia, though it may be nearly absent. The lachrymation is profuse, acrid and burning, as is also the thick, yellow, muco-purulent discharge, which is usually present excoriating the lids, making them red, inflamed and sore, as well as giving the cheek an appearance as if varnished. The conjunctiva may be quite red, with chemosis. The pains are not characteristic though usually smarting, sticking or burning,



from the nature of the discharges. Fluent coryza often accompanies the above symptoms.

*Purulent ophthalmia* has been benefited, particularly that form found in new-born children (*ophthalmia neonatorum*). The condition of the lids and nature of the discharges already given, which indicate its choice, will be found more often in the later stages than at the beginning of the disease.

The following case indicates that it may be useful in *paralysis of the muscles*: A man, æt. 52, appeared for treatment, with total paralysis of the oculo-motor nerve, even to those filaments which supply the iris and ciliary muscle, which came on rapidly after exposure in the cold and wet. Electricity was applied every day or two for about five weeks, and either *Rhus* or *Caust.* given internally at the same time, with no benefit. At the end of this time, on account of some slight catarrhal symptoms, *Euphrasia*<sup>30</sup> was given and the electricity continued. After taking two doses of *Euphrasia* the upper lid could be slightly raised, the pupil began to contract and the eye to turn inward; within four weeks a complete cure was effected.

*Euphrasia* is very similar to *Mercurius* in the character of its discharges, only that in *Merc.* they are thin and excoriating, while under *Euphrasia* they are thick and excoriating. *Arsenicum* also has acrid secretions, but they are usually thin, not as profuse as in the above remedies and are accompanied by much burning pain and photophobia. *Rhus*, like *Euphrasia*, has profuse lachrymation, but it is not as excoriating. In paralysis of the muscles, caused by exposure to cold or wet, *Euphrasia* may be compared to *Caust.* and *Rhus*, the remedies upon which we chiefly rely in these affections, but it seems especially called for when a catarrhal condition of the eye is, at the same time, present.

### FERRUM.

Sticking pain over the left eye, coming suddenly and lasting a short time only. Photophobia. Lids swollen and profuse discharge of pus when opened. Inflamed eyes with burning stinging pains.

**Clinical.**—The iodide of iron has been used by Dr. Liebold with benefit in exophthalmic goitre. In one case, occurring in a woman after suppression of the menses and characterized by pro-

trusion of the eyes, enlargement of the thyroid gland, palpitation of the heart and excessive nervousness, the menses soon reappeared, the nervousness diminished and all the symptoms improved after the administration of Ferrum iodatum. Another similar case, occurring in a colored woman, was relieved by the acetate of iron.

### FERRUM PHOSPHORICUM.

First stage of abscess of the cornea, for the pain and redness. Inflammation of the eyes, with acute pain, without secretion of mucus or pus. Acute conjunctivitis. Conjunctivitis and photophobia in measles. Pain in the eyeball aggravated by moving the eyes. Retinitis. *Eyes inflamed, red, with burning sensation, sore and red looking. Sensation as if grains of sand were under eyelids.\**

Clinically this remedy has proven of great value in parenchymatous keratitis where there is excessive inflammation. The cornea appears as though a hæmorrhage had occurred in its layers. Excessive lachrymation and photophobia.

### FLUORIC ACID.

Sensation as if the eyelids were opened by force and a *fresh wind were blowing on them*; after that, sensation like sand in the eye, which had the same feeling as if the eyes were inflamed.

**Clinical.**—A case of lachrymal fistula on the left side, of one years' duration, with clear, yellow scab on the cheek, near the inner canthus, which is but slightly red and painful to pressure. Every three or four days it begins to itch, grow moist, then heals again; it is sometimes painful before it opens. Fluoric acid<sup>30</sup> cured.—C. HERING.

The symptom, *as if cold wind were blowing in the eye*, has been frequently verified in various ophthalmic diseases.

### GELSEMIUM.

**Objective.**—*Drooping of the eyelids.* Eyelids half closed, with apparent inability to move them. Lids close on looking steadily at anything. Irritability of the conjunctiva. Pupils dilated. Iris sluggish. Eyeballs oscillate laterally.

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\* The Twelve Tissue Remedies, Boericke & Dewey, 1888.

**Subjective.**—Soreness of the eyeballs. *Great heaviness of the lids.* Drawing over the eyes. Dull, full feeling (attended with some aching) in the whole of the orbits. Aversion to light. Orbital neuralgia. Eyes tire upon using for near vision. Pain running from over the eyes to the occiput, aggravated on the right side. Bruised pain above and back of the orbits.

**Vision.**—Dimness of vision. *Dimness of sight and vertigo.* Black and bright specks before eyes. Glimmering appearances before the eyes. *Smoky appearance before the eyes, with pain above them.* Objects appear double. Diplopia which can be controlled by an effort of the will. Diplopia when inclining the head toward either side, but vision single when holding the head erect.

**Clinical.**—Gelsemium is rarely found of benefit in superficial affections of the eye, but is especially adapted to diseases of the fundus and paralysis of the nerves.

*Its action upon the uveal tract is very marked, especially in the serous form of inflammation,* either when it involves the iris, ciliary body and choroid separately or all three at the same time. In serous iritis, the hypersecretion and cloudiness of the aqueous humor, together with moderate ciliary injection and varying amount of pain in the eye and head, will be our chief indications. (Compare with Kali bichrom., which is the remedy for descemetitis, improperly classed by some authorities under serous iritis).

In *serous choroiditis* Gelsem. is a remedy of the first importance. According to Dr. W. A. Phillips in a paper read before the Am. Hom. Ophth. and Otol. Soc., in 1881, the symptomatic indications for its use in serous choroiditis are: "1. A dull pain in or about the eye, extending all of the time, or periodically, or finally, to the back of the head, and ameliorated by hot applications, but not by cold. 2. Impairment of vision gradually developed and not characterized by sudden changes, either for the better or the worse. 3. Heaviness of the lids. 4. Inability to accommodate the eye quickly for varying distances. 5. The asthenopic symptoms not marked by great irritability of the eye, but resulting from an evident want of tone or energy of the muscular structures—in other words, a passive asthenopia rather than active. 6. In general, a feeling of depression and lassitude, which is not relieved by food or stimulants." In addition to the above it will usually be found that the *haziness of the vitreous* is very fine, the tension

tends to increase, the pupil to dilate and the eyeball to become sore to touch, with aching pain over and in the eye. The impairment of vision is not necessarily constant, as it may vary greatly, being one day very dim and the next quite bright.

Its usefulness in serous inflammation of the whole uveal tract (irido-choroiditis) is sufficiently illustrated in the following case: A woman, æt. 32, had complained of the eyes being weak for two months, but worse recently. Right vision  $\frac{2}{100}$  with difficulty. Left vision, counted fingers at 20 feet. Ophthalmoscope showed serous inflammation of the iris and choroid, deposits on the membrane of Descemet, aqueous and vitreous hazy in both eyes and left pupil dilated and sluggish. There was a sensation of pressure over both eyes and headache in the temples. She was a seamstress and would not take proper rest. R. Gelsem.<sup>30</sup> Two weeks later she reported that she began to improve immediately on taking the above powders, had taken no other medicine and had used the eyes all the time for sewing. Right vision  $\frac{2}{30}$  with difficulty. Left  $\frac{2}{20}$  with difficulty. Eyes appeared perfectly well, with the exception of a few small points on the posterior surface of the cornea and slight dilatation of the left pupil, which eventually disappeared.

From its value in serous inflammations and from some temporary benefit derived from Gelsemium in glaucoma, it is recommended for this disease, especially if dependent upon increased secretion. (Glaucoma is probably usually due to obstruction in excretion.) Dr. F. Park Lewis reports that it has been of use to him in "one case of glaucoma after iridectomy. Notwithstanding a large coloboma in both eyes, the sight began to diminish and pain and tenderness to come back in the head. Gelsem.<sup>1</sup> relieved the pain and somewhat benefited the sight."

Dr. C. M. Thomas writes me: "In disseminate choroiditis and retino-choroiditis with no outside symptom, the good effect of Gelsem. is undoubted and it is used by me almost to the exclusion of other remedies."

A case of retinitis albuminurica, in which the dimness of vision came on suddenly during pregnancy and was worse after delivery, was cured under Gelsemium. There were white patches and extravasations of blood throughout the retina, while the outer part of the optic nerve appeared whiter than usual. There was no pain, only an itching of the eyes.—T. F. A.



Another great sphere of usefulness for this drug is to be found in *detachment of the retina*. Dr. F. H. Boynton first reported a case cured under Gelsem. in which the detachment had been present three weeks and was dependent upon an injury. It was accompanied with diffuse haziness of the vitreous and serous inflammation of the choroid and retina. In one month, under Gelsem.<sup>30</sup>, the vision improved from perception of light to  $\frac{20}{70}$  and the retina became completely re-attached. Since then similar results have been obtained from its use in detachment of the retina, from myopia. (Compare Arnica and Aurum.) It is no doubt the most commonly indicated remedy in this affection.

In paresis or paralysis of any of the ocular muscles, decided benefit has often been derived from the use of this remedy. It has been of service in paralysis following diphtheria (Buffum), and when associated with paralysis of the muscles of the throat, although often when indicated there is a complete lack of all subjective or objective symptoms, with the exception of the impairment of the muscle.

In asthenopia, dependent upon weakness of the external recti muscles, Gelsem. was highly recommended by Dr. W. H. Wood-yatt. As a remedy for clearing up troublesome asthenopic symptoms, even local irritations, such as blepharitis and conjunctival hyperæmia, due to refractive errors, Dr. C. M. Thomas has found it more serviceable than any other drug.

In paralysis of the nerves, compare Gelsem. with Caust., Conium and Rhus, and in serous choroiditis compare with Bryonia. The condition which indicates Gelsemium is usually one of stolid indifference to external irritants, in which respect it stands in marked contrast to Conium, whose paralytic symptoms are characterized by great reflex irritability, photophobia, etc.

### GRAPHITES.

**Objective.**—A styte on the lower lid, with drawing before the discharge of pus. Red, painful inflammation of the lower lid and inner canthus. *Very inflamed margins of the lids. Canthi crack and bleed easily. Inflammation of the external canthus. Dry mucus in the lashes.* Agglutination of the eyes in the morning. Redness of the whites of the eyes, lachrymation and photophobia, with a muco-purulent, thin and excoriating discharge. Lachrymation.

**Subjective.**—Sensation of dryness in the lids and pressure. Heaviness of the lids. Heat about the lids. Heat, burning and biting in the eyes. Smarting and biting in the eyes.

**Vision.**—Vanishing of sight during menstruation. Intolerance of light, with redness of the eyes. *Great sensitiveness of the eyes to daylight.* Letters appear double and run together when writing. Flickering before eyes.

**Clinical.**—There are few remedies in the materia medica so commonly indicated in inflammatory conditions of the lids, conjunctiva and cornea as Graphites, especially if occurring in scrofulous subjects, with eczematous eruptions, which are moist, fissured, bleed easily and are situated chiefly on the head and behind the ears.

It is particularly indicated in the *chronic form of blepharitis*, or in eczema of the lids, though sometimes called for in acute attacks, especially if complicated with such affections of the cornea as ulcers and pustules. In chronic ciliary blepharitis, in which Graphites is useful, *the edges of the lid will usually be found slightly swollen and of a pale red color; the inflammation may be confined to the canthi (blepharitis angularis), especially to the outer, which have a great tendency to crack and bleed easily* upon any attempt to open the lids; the margins may be ulcerated; *dry scurfs are usually present on the ciliæ*; there may be burning and dryness in the lids and biting and itching, which cause a constant desire to rub the eyes. (Compare with Antimon. crud., which is adapted to pustules on the margins of the lid.)

In one case of slight roughness of the integument of the lids, with intense itching, which had been present for a year or more, quick and permanent relief was obtained from Graphites.

It is of service in preventing the recurrence of successive crops of styes. It is also valuable in eczema of the lids if the eruption is moist and fissured, while the margins of the lids are covered with scales or crusts.

In catarrhal ophthalmia Graphites has been employed with benefit, and in scrofulous ophthalmia characterized by ulcers and pustules it is second to no other drug in importance. It has cured deep ulcers of the cornea, even with hypopyon, but it is more particularly adapted to superficial ulcerations, especially if resulting from pustules; often with considerable vascularity of the

cornea. The pustules which have been removed under the influence of Graphites have been of various kinds and accompanied by various symptoms; they may be either on the cornea or conjunctiva, but especially on the former; the attacks may be acute or chronic, but it is particularly called for in the chronic recurrent form.

The *photophobia is usually intense* and the lachrymation profuse, though in some cases nearly or entirely absent; it is generally worse by daylight than gaslight and in the morning, so that often the child cannot open the eyes before 9 or 10 A. M. The redness of the eye is generally marked and the discharges of a mucopurulent character, constant, thin and excoriating. The pains vary and are not important, being sometimes sticking, burning, aching or itching in character. The lids are red, sore and agglutinated in the morning or else covered with *dry scurfs* and the *external canthi are cracked and bleed easily* upon opening the eye. A thin, acrid discharge from the nose often accompanies the ophthalmias of Graphites.

Graphites is somewhat similar to Hepar and Sulphur in scrofulous inflammation of the eyes. Under Graphites, however, the discharges from the eyes and nose are thinner and more excoriating, and there is a greater tendency toward cracking of the external canthi. The latter symptom is also sometimes observed under Hepar, but is not as marked, and the discharge is not as excoriating, though the lids are more swollen, eyes redder and ulceration deeper. The Sulphur patient is more restless and feverish at night, and complains of occasional sharp sticking pains in the eye; though the face and body may be covered with eruptions, they differ in character from those of Graphites.

#### HAMAMELIS VIRGINICA.

Eyes inflamed and burning. Intense soreness as from a foreign body. Swelling of eyelids. Feeling as if the eyes would be forced out.

**Clinical.**—A spontaneous eversion of the upper lid during the course of a severe conjunctivitis was relieved by the application of dilute "Pond's Extract."—W. S. SEARLE.

This remedy has been employed with decided success in inflam-

mation of the conjunctiva or cornea, even in ulceration of the latter, if caused by a burn or an injury.

The action of Hamamelis in injuries of the eyeball is very similar to that of Arnica and Calendula, although it seems to be of more service than either of the above in *hastening the absorption of intra-ocular hæmorrhages*.

Traumatic iritis with hæmorrhage into the iris, traumatic iritis with great pain at night, and hæmorrhage into the interior of the eye, have been speedily relieved by this drug.

### HEPAR SULPHUR.

**Objective.**—*Redness, inflammation and swelling of the upper lid*, with pressive pain. The lids are closed in the morning on waking, so that she cannot open them for a long time. Inflammation and swelling of the eye, with redness of the white. Intense photophobia and profuse lachrymation.

**Subjective.**—Smarting pain in the external canthus, with accumulation of hardened mucus. Pains in the eyes from the daylight. Feeling as if the eyes were being pulled back into the head by strings. *The eyes are very painful in bright daylight if he attempts to move them*. Pressure in the eyes, especially on moving them, with redness. Eyes sore, agglutinated at night; secretion of hardened mucus. Pressive pain in the eyeballs and a feeling as if beaten when touched. Boring pains in the upper bones of the orbit. Eyeballs sore to touch.

**Vision.**—Obscuration of vision while reading. The eyes become dim and he cannot see well in the evening by candle-light. Feeling of blindness before the eyes on rising and standing up after sitting bent over. Field of vision reduced one-half. Complaints of a continual movement of bright circles before the eyes. Objects look too large.

**Clinical.**—In dacryocystitis and orbital cellulitis Hepar is a remedy of importance, especially if *pus has formed and there is great sensitiveness to touch, with throbbing pain*. It may prevent the formation of pus or accelerate its discharge; it also seems useful in controlling the discharge after the canaliculus has been opened.

Hepar may be called for in chronic ciliary blepharitis if com-



plicated with swelling of the meibomian glands, or ulcers and swellings on the margin of the lid, which are painful in the evening and upon touch, though its chief sphere of action in palpebral diseases is in *acute phlegmonous inflammation of the lids*, which tend toward suppuration. The inflamed lids will be swollen, tense and shining, as if erysipelas had invaded them, with *throbbing*, aching, stinging pain and sensitiveness to touch; *the pains are aggravated by cold and relieved by warmth*.

Eczema of the lids, in which thick honey-comb scabs are found both on and around the lids, with nocturnal agglutination, etc., is especially amenable to Hepar.

Palpebral tumors have frequently disappeared under its use.

It is sometimes useful in simple catarrhal conjunctivitis after the inflammatory stage has passed, and also in some cases of purulent conjunctivitis characterized by profuse discharge and excessive sensitiveness to air and touch. Pustules on the conjunctiva may require its use, but not usually, unless the cornea has become involved.

For the severer forms of strumous ophthalmia, in which the pustules and ulcers invade the cornea and are marked by great intensity of the symptoms, there is probably no remedy more frequently indicated than Hepar. Its value in *ulcers and abscesses of the cornea*, especially the deep sloughing form of ulcer complicated with hypopyon, is undoubted. It has proved curative in some torpid ulcers in which general symptoms have pointed to its use, but there is usually *intense photophobia*, *profuse lachrymation*, *great redness of the cornea and conjunctiva*, even chemosis, and *much pain* of a *throbbing*, aching, shooting character, which is *relieved by warmth*, so that one constantly wishes to keep the eye covered, and is worse on any draught of air (Sil.), at night or in the evening; the lids are often swollen, spasmodically closed and *very sensitive to touch*, or may be red, *swollen and bleed easily upon opening*.

It has been successfully employed in acute aggravations of pannus which tend toward ulceration, especially if occurring in mercurialized subjects.

In keratitis parenchymatosa it often serves to promote absorption after the disease has been checked by Merc., Aurum., Calc. or other remedies. It may, however, be of service in arresting the progress of the disease, as is well illustrated in the following

case: Mary A——, 33 years of age. For three months the left cornea had been so hazy that the iris could only be seen with difficulty, and for two months the right cornea had gradually become involved from the periphery toward the centre. Both cornea were wholly opaque and vision lost. There was considerable pain in the eyes and head, with iritis. The ciliary injection was great and the dread of light excessive; lachrymation marked. There was no history of syphilis, but she suffered severely from rheumatic pains, particularly in the shoulder. Various remedies, high and low, had been given for two months with no avail. Under Hepar<sup>30</sup> rapid improvement took place; in a month she was discharged with fair vision and only moderate haziness of the corneæ.

*Kerato-iritis* frequently requires the use of this remedy, especially if characterized by ulceration of the cornea, hypopyon, sensitiveness to air and touch.

For *hastening the absorption of pus in the anterior chamber* (hypopyon) there is no better remedy than Hepar. On this account it has been employed with benefit in iritis with hypopyon, or associated with small abscesses in the iris (suppurative iritis). It has also appeared to exert a very beneficial influence in purulent capsulitis after cataract extraction, either used alone or in alternation with Rhus.

Inflammation of the ciliary body, in which the sensitiveness to touch is excessive, sometimes yields to this drug.

From its usefulness in suppurative inflammation in general, it has been administered with benefit in suppurative choroiditis or panophthalmitis.

Ulceration of the external parts of the eye, which bleed easily and are very sensitive to touch, most positively indicate Hepar. These cases usually have excessive photophobia, which is also very marked in Merc. protoiod.; while Kali bichrom., though indicated in extensive destruction of tissue and great sensitiveness of the eye to touch, lacks entirely the photophobia so marked under Hepar.

### HYDROCOTYLE.

**Clinical.**—This remedy has seemed to be of benefit in some cases of tumors of the lid, especially in epithelioma. Linnell cured a case of lupus with this drug.

### HYOSCYAMUS.

Eyes look red, wild, sparkling. Squinting. Pupils dilated. Spasmodic closing of the lids, eyes rolling about in the orbits. Spasmodic action of the internal rectus.

Obscuration of vision; objects seem indistinct; he is near-sighted and is obliged to hold the book nearer than usual when reading. Dimness of vision, as if a veil were before the eyes. Deceptive vision; the flame of one light seemed smaller, that of another larger, though both were of equal size. Illusions of vision; small objects seem very large.

**Clinical.**—A case of hemeralopia in a myopic eye, with shooting pains from the eyes into the nose and head and accompanied by headache ameliorated on closing the eyes, was relieved by Hyos.—T. F. A.

### HYPERICUM.

**Clinical.**—The benefit which has been observed from this remedy in relieving the pain in old cicatrices led Dr. John L. Moffat to its use in a case of pain and irritation of the eye from an anterior synechia which resulted from an injury two or three years previous. The healthy eye was also irritable. Hypericum<sup>3</sup> relieved.

### IGNATIA.

Pain extending from the head into the left eye, when the eyes began to burn and water. Ciliary neuralgia. Pressure within the eye as from sand. Sensation as if a particle were in the left external canthus. Pain in the inner surface of the upper lid as if it were too dry in the evening. Intense, but fitful photophobia. Constant winking, with spasmodic action of the muscles of the face.

Unable to endure the glare of light. Zigzag and serpentine, white flickering at one side of the field of vision.

Morbid nictitation, with spasmodic action of various muscles of the face, has been relieved by this drug.

Catarrhal conjunctivitis with a sensation as of sand in the eye and great dryness, may require this remedy, as in the following: A lady, artist, of dark complexion. So excessively nervous that

she started at the slightest noise, had been working late at night. She complained of one eyelid feeling as if sand were under it, with great dryness. Diagnosis, conjunctivitis palp. ac. Ignatia, 3d dec., one dose, removed the feeling in half an hour.—F. PARK LEWIS.

Dr. J. H. Buffum reports the following: Two "chipping ulcers" at upper margin of right cornea, accompanied by periorbital pains, sharp sticking, generally in one spot in superciliary ridge, temple or side of head. The sleep was disturbed and digestion poor. Ignatia<sup>6</sup> cured in four days.

Dr. W. P. Fowler reports\* a case of "hyperæsthesia of the retina with hysteria," characterized by intense photophobia and ciliary neuralgia with general nervous symptoms, which was cured in ten days under Ignatia<sup>3</sup> and proper hygienic measures.

A case of ciliary neuralgia in a woman was cured very promptly by this remedy; the pains were very severe, extending from the eye to the top of the head, producing nausea, and often alternated with swelling in the throat (globus hystericus); the pains would begin very slightly, increase gradually until they became very severe and would only cease when she became exhausted.

From a study of the clinical application of Ignatia it will be seen that its usefulness is confined almost exclusively to those ophthalmic affections which may be found in nervous, hysterical patients.

### IPECACUANHA.

Inflammation of the eyes. On opening the right lids, which were swollen, there was a copious gush of tears. The conjunctiva of the bulb was injected and infiltrated. *The cornea was dim, as if infiltrated; on close examination there was noticed a number of small depressions.* Intense tearing or tensive pains in the eyes. *Great photophobia.* Profuse lachrymation. Conjunctiva injected, especially of the lid. Skin of lids red. Pupils contracted. Constant severe pain over the eyes, especially the left. Blue and red halo around a light.

**Clinical.**—My attention was first directed to Ipecac. as a remedy for pustular inflammation of the cornea and conjunctiva by Dr. A. Wanstall, who was led to its use from an article of Jousset's recom-

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\* Trans. Am. Hom. Oph. and Otol. Soc., 1879.



mending it as a remedy for pustular conjunctivitis. W. says: "In my hands it has been as near a specific as can be, and certainly I have never handled any one drug that will cure as many cases." It is no doubt a very valuable remedy for *phlyctenular ophthalmia*, as I have had occasion to verify in many cases. It is adapted to both phlyctenules and ulcers of the cornea or conjunctiva, especially if there is *much photophobia* with redness and lachrymation. (Con. has intense photophobia, but with little or no redness of the conjunctiva or lachrymation.) The cornea may be vascular. The redness of the conjunctiva, lachrymation and pain are variable, though are usually well marked. Nausea occasionally accompanies the above symptoms. (Compare Conium, Hepar and Merc. protoiod.)

### JABORANDI.

*Contraction of the pupil. Tension of the accommodative apparatus of the eye*, with approximation of the nearest and farthest points of distinct vision. *Everything at a distance appeared hazy, and although he could read moderate-sized type at one foot, at two feet it was indistinct. The state of vision is constantly changing*, becoming suddenly more or less dim every few moments. Twitching of lids. Eyes tire on reading. Spots before vision. Headache on using eyes.

**Clinical.**—In 1878, after a study of the physiological action of Jaborandi upon the eye, I determined to test its value, according to the law of similia, in *spasm of the accommodation*. The results in many cases exceeded my most sanguine anticipations.

Selected from a large number of cases are the following which will illustrate its sphere of action:

CASE I.—*Hyperopia et spasmus musc. cil.* James L., æt. 32, complained of everything becoming black before the eyes on stooping, aching of the eyes on reading and spots before the vision. V.  $\frac{2}{3}0$ . With concave 42, V.  $\frac{2}{2}0$ . Ophthalmoscope showed slight hyperopia. R. Jaborandi<sup>3</sup>. Three days later all the symptoms were relieved; V.  $\frac{2}{3}0$ .

CASE II.—*Spasmus musc. cil.* Mr. M., æt. 32. V.  $\frac{2}{3}0$ . Concave 42, V.  $\frac{2}{2}0$ . For nine months, had had spots before the vision and aching of the eyes upon using. In three days, under Jabor.<sup>3</sup>, vision had become  $\frac{2}{2}0$  and the muscæ volitantes had disappeared.

CASE III.—*Myopia cum spasmus musc. cil.* Mr. R., æt. 28. For seven years had been writing in a poor light all day. He thought his near-sightedness had appeared within one or two years. He complained of the myopia increasing and the eyes tiring on using them one and one-half hours. Fundus normal. V.  $\frac{2}{7}$  o. u. Concave 40, V.  $\frac{2}{20}$ . Three weeks after using Jaborandi<sup>3</sup>, he reported that he had used his eyes more than usual and had experienced no trouble. V.  $\frac{2}{5}$  o. Concave 50, V.  $\frac{2}{20}$ .

CASE IV.—*Hyperopia cum asthenopia.* Miss S., æt. 40. For many months had not been able to read more than five minutes without the eyes tiring. *Nausea was always produced on looking at objects moving.* Jaborandi<sup>3</sup> relieved the nausea in twenty-four hours, and in a week she could read three-quarters of an hour without inconvenience.

The following symptoms observed in various anomalies of refraction have also been speedily relieved by this drug: Blur before the eyes at times, especially on looking in the distance. Eyes tire easily and are irritable, especially on moving them. Heat and burning in the eyes upon using. Headache upon using the eyes. Smarting and pain in the globes on use. Dim vision, twitching of the lids and pain in the eyeballs.

From the above it will be seen that Jaborandi is of the greatest importance in *spasm or irritability of the ciliary muscle*. In explanation of its usefulness in so-called asthenopia, I am inclined to believe that a large number of these cases are not dependent upon true weakness of the accommodation, but upon an *irritable weakness* and that Jaborandi relieves by virtue of its power to control irritation. This is also further demonstrated in its ability to relieve reflex symptoms, as in case IV., in which *nausea and vertigo due to reflex irritation from the eyes* were at once cured by this drug. Thus far these two reflex symptoms have been valuable and characteristic indications.

From examination into the general sphere of action of Jaborandi it should be suggested to our minds as a remedy for serous choroiditis and in one case it has improved the vision somewhat.

Its action upon the ciliary muscle seems to extend to a limited degree to the internal recti. It is, therefore, recommended for periodic convergent squint, for strabismus of recent date not dependent upon weakness of the opposing muscle in which for one

reason or the other it is necessary to postpone the operation and for the tendency to recurrence of squint after an operation.

Jaborandi is very similar to Physostigma and Agaricus in its action upon the accommodation, though it has been of more service to me in spasmodic affections of the ciliary muscle than either of the two latter remedies. It is opposed to Duboisin in its action; the latter being indicated in *true* weakness of the accommodation, while Jaborandi is called for in *irritable* weakness.

### KALI BICHROM.

**Objective.**—Margins of the lid very red. Dark rings about the eyes. Inflammation of the eyes, with yellow discharge and agglutination in the morning. Inflammation of the eyes. Redness of the conjunctiva, with lachrymation. Conjunctiva both of bulb and lids injected. Appearance of small white pustules in the conjunctiva. Pustules on left cornea, with surrounding indolent inflammation.

**Subjective.**—Itching and burning in both eyes, lachrymation and photophobia. Heat and pressure in the eyes. Violent shooting pain from the root of the nose along the left orbital arch to the external angle of the eye exactly, with dimness of sight like a scale on the eye. Heavy pain above the eyes aggravated on motion and from cold. Much smarting of the eyes aggravated in the evening and in the open air. Especially useful in affections due to a rheumatic diathesis.

**Clinical.**—The local application of a saturated aqueous solution of bichromate of potash to large acute granulations of the lids has often caused their disappearance. It is, however, also serviceable as an internal remedy in trachoma and pannus.

Kali bichr. is of great value and especially indicated in mild cases of croupous conjunctivitis (a condition midway between purulent and genuine croupous inflammation), in which the false membrane is loosely adherent, easily detached and has a tendency to roll up and separate into shreds, which come away in the discharges, giving them a stringy appearance. The discharges are profuse and the conjunctiva very much inflamed; even chemosis. The lids are swollen and the cornea may be hazy.

It is of especial importance, however, in chronic indolent forms

of inflammation of the eye, particularly of ulcers and pustules on the conjunctiva or cornea, in which no active inflammatory process is present and therefore characterized by *no photophobia or no redness* or very little, not as much as might be expected from the nature of the disease; the pains and lachrymation are also usually absent. Corneal ulcers which have a tendency to bore in without spreading laterally indicate Kali bichr. The eye may be quite sensitive to touch and the secretions are of a *stringy character*.

Opacities of the cornea have been cleared under this remedy; sometimes used internally alone and again both externally and internally.

For *true descemetitis*, characterized by fine punctate opacities in the membrane of Descemet, especially over the pupil, with only moderate irritation of the eye, there is no remedy so frequently called for as Kali bichr. If a serous inflammation of the iris accompanies the changes in the membrane of Descemet, Gelsemium should be suggested to our minds.

### KALI CARBONICUM.

**Objective.**—Inflammation of the lids of the right eye, with pain in the eyes and inability to read by the light. *Swelling between the eyebrows and lids like a sac*. Redness of the white of the eye, with many vessels in it. Lachrymation.

**Subjective.**—Pressure above the eyes. Sharp tearing in the right orbit and in the eye at night. Soreness of the external canthus with burning pain. Burning, biting and pressure in the eyes. The eyes are painful on reading. Stitches in the middle of the eye. Smarting pain in the eye. Weakness of vision. Photophobia. Bright sparks, blue or green spots before the eyes.

**Clinical.**—Œdema of the lids, especially if accompanied by sticking pains and heart indications, often subsides under the use of Kali carb.

It may be occasionally of service in small round ulcers of the cornea with no photophobia.

The verified symptoms indicate its usefulness in asthenopic troubles.

### KALI IODATUM.

Œdematous swelling of eyelids. Inflammation of the conjunctiva with purulent secretion; chemosis. Eyes red and burn. Lachrymation.



Vision dim and foggy; she sees objects only indistinctly. Pain over the left side of the head and in the eye, aggravated on dark, stormy days.

**Clinical.**—The iodide of potassium is of the greatest importance in the treatment of many *syphilitic affections of the eye*. It serves to antidote the syphilitic poison, and there should be no hesitation in employing it in material doses.

Periostitis of the orbit will often require this remedy, especially if of syphilitic origin, though cases in which there has been no trace of syphilis have been benefited. There will be more or less swelling extending to the temple, with œdema of the lids. The pain may be intense or absent entirely.

Tumors of the orbit have disappeared under the use of material doses of Kali iod., as in the following: "A colored woman, with a history of syphilis, had several tumors on the entire upper border of the left orbit. The growths were very hard and encroached considerably upon the upper lid, especially at the inner corner; were painless and presented no signs of inflammation or softening. Entirely disappeared under the iodide of potassium in material doses."—A. WANSTALL.

It is sometimes useful in stricture of the lachrymal duct.

Its action in pustules of the conjunctiva and cornea is very similar to bichromate of potash, and it has been used with benefit in similar cases.

In *syphilitic iritis*, Kali iodatum is of great value. It is especially indicated if the inflammation is very severe and unyielding to the influences of atropine. The inflammatory process in the iris is so high that the pupil tends to contract, notwithstanding the frequent instillation of the strongest solution of atropine. *The iris is much swollen and the aqueous more or less cloudy. The ciliary injection is very marked and of a bright angry appearance.* The pain may be severe, but is worse at night. The photophobia and lachrymation are variable.

Kali iodatum is a very prominent remedy in the treatment of acute or chronic irido-choroiditis and disseminate choroiditis, especially if of syphilitic origin. In one typical case of syphilitic choroiditis, recently under treatment, in which the chief symptom was an *excessive and variable amount of haziness of the vitreous*, the vision improved from R. V., counts fingers (held to outer side of

the field) at two feet and L. V.  $\frac{10}{200}$ , to normal, under the daily use of fifteen grains of the iodide of potassium. Its special indications are not known, though its effects are often marvellous, even when the disease is non-syphilitic in origin.

In paralysis of any of the muscles dependent upon syphilitic periostitis the iodide of potassium is the remedy most frequently called for. The following case of paralysis of the left nervus abducens will show its action: A man, 40 years of age, ten days previous to his appearance for treatment awoke in the morning with dizziness, and afterward had three similar attacks. Had had a very severe cold. For two days had noticed a blurring of vision and diplopia which had been steadily increasing and was only noticed on looking to the left. Examination showed only slight action of the left external rectus. R. Caust.<sup>30</sup>. Two days later the paralysis of the muscle had become complete. It was found that he had syphilis. R. Kali iod., eight grains a day. In two days decided improvement was observed, and in two weeks the muscle had regained its normal power.

### KALI MURIATICUM.

Discharge of white mucus from the eyes, or yellow-greenish matter. Superficial flat ulcer of the eye arising from a vesicle. Blisters on the cornea. Feeling of sand in the eye. Onyx and hypopyon.

**Clinical.**—The recommendation by Schüssler of Kali mur. for the stage of exudation in inflammations suggested its employment in parenchymatous keratitis, especially since we know that the Kali's are adapted to indolent forms of inflammation, which this form of keratitis usually assumes. The following cases will give its sphere of action in *parenchymatous keratitis*: Mr. L., æt. 35. For three months there had been an infiltration into the right cornea, which commenced at the outer side and extended over the whole cornea. He could only count fingers. There was occasional pain, moderate photophobia and redness. The pupil dilated slowly and incompletely, though regularly under atropine and contracted quickly. Aurum mur., Cinnabar and other remedies, with atropine externally, had been used with no benefit, except some relief of pain. Under Kali mur., 6th dec., the inflam-

mation was soon arrested and the cornea gradually cleared. In three months R. V.  $\frac{20}{60}$ . The improvement has continued.

In asthenic ulcers of the cornea with but little redness, photophobia, lachrymation or pain. The ulcer generally begins at the periphery and extends toward the centre, its base is a dirty white or yellow, often very vascular and with considerable infiltration of cornea around the ulcer and with a moderate amount of mucous discharge. In some cases the infiltration becomes more purulent in character and extends between the layers of the cornea (onyx) or into the anterior chamber (hypopyon), but even then the inflammation retains its asthenic type.

The benefit which has been derived from the muriate of potassium in a case of chorio-retinitis indicates that it may be a valuable remedy in intra-ocular troubles.

### KALMIA LATIFOLIA.

Sensation of stiffness in the muscles around the eyes and of the eyelids. Pain in the eyes, which makes it painful to turn them. Glimmering before the eyes. Ptosis with supra-orbital neuralgia. Pain over right eye, giddiness, eyes weak and watery.

**Clinical.**—From its action upon the muscles we are led to give it in asthenopia and with good results, especially if there is present a *stiff drawing sensation in the muscles* upon moving the eyes.

Sclero-choroiditis anterior, in which the sclera was inflamed, vitreous perfectly filled with exudation and glimmering of light before the eye, especially on reading with the other, was cured by this drug.—T. F. A.

Kalmia was prescribed in a case of retinitis albuminurica occurring during pregnancy, on account of the characteristic pains in the back; it was continued for a long time, during which the white patches gradually became absorbed and recovery took place.—T. F. A.

Dr. Hunt reports several cases of rheumatic iritis with sharp pain, boring in the eye, ciliary injection and tenderness of the eye, in rheumatic subjects, promptly relieved by this drug.

Dr. Boyle cured a case of tenonitis with Kalmia in which the lids were red and swollen, chemosis and pain on movement and

pressure of the eye. Also several cases of scleritis with syphilitic history after Kali iod. had failed.

### KREOSOTUM.

Burning and redness of the conjunctiva. Smarting in the eyes. The tears are acrid like salt water. Chronic swelling of the eyelids. Twitching of lids.

**Clinical.**—Kreasote has been of service in acute aggravations of chronic keratitis, in which there was excessive, hot, smarting lachrymation; also in blenorrhœa of the conjunctiva, with moderately profuse discharge and much smarting in the eyes.—T. F. A.

### LACHESIS.

**Subjective.**—The eyes feel stiff. Aching of the eyes, especially of the left. A sticking, drawing pain in the right eye extending up to the vertex. Pressure in the eyes. Stitches as from knives in the eyes, coming from the head. Pains near the eyes.

**Vision.**—*Dimness of vision; much black flickering before the eyes,* that seems very near; it frequently makes reading difficult. A fog before the eyes; in the evening a bluish-gray ring, about six inches in diameter, around the light. Eyes sensitive to light. *Flickering before the eyes.* Flickering and jerking in the right eye, with violent congestion to the head. Flickering before the eyes; as from threads, or rays of the sun. Flickering in peculiar angular zigzag figures, with congestion to the head and headache. A beautiful bright blue ring about the light that was beautifully filled with fiery rays.

**Clinical.**—A case of orbital cellulitis, following an operation for strabismus, was effectually and rapidly cured under this remedy. The symptoms were a marked protrusion of the eye and chemosis, with a purulent discharge and sloughing at the point of tenotomy, with a black spot in the centre of the slough; the retina was hazy and congested.—T. F. A.

Lachesis is sometimes useful in phlyctenular keratitis, especially the chronic recurrent form, in which the surface of the cornea may be ulcerated, with moderate redness of the eye. The chief characteristic, however, has been the marked *photophobia, which is*



*always worse in the morning and after sleeping.* The various pains in the eyes and head are also subject to the same aggravation.

As already referred to in the article upon *Crotalus*, *intra-ocular hæmorrhages* will often call for *Lachesis*. Many cases might be given to illustrate its usefulness in this respect, but little would be gained by so doing, for the eye indications, with the exception of the hæmorrhages, have usually been unimportant or absent altogether. It may be said, however, that hæmorrhages into the anterior chamber, into the vitreous, into the retina and into the choroid, whether of spontaneous origin or dependent upon various diseased conditions, have all been seen to speedily disappear under the use of this remedy. The general indications are of more value in the selection of this drug than those relating only to the eye. The brilliant results often observed from its employment in retinitis apoplectica do not seem to be confined to the absorption of the hæmorrhages as it also appears to control the inflammatory symptoms and diminish the tendency to retinal extravasations.

Is of value in relieving asthenopic symptoms.

### LACTIC ACID.

**Clinical.**—Hyperæsthesia of the retina, with steady aching pain in and behind the eyeball, was quickly relieved by a few doses of Lactic acid.—T. F. A.

### LEDUM PALUSTRE.

A pressure (or dull pain) behind the eyeball as if it would be forced out. Photophobia. Dilated pupils. Acrid lachrymation and burning of lids.

**Clinical.**—Ledum has proved chiefly beneficial in contusions or wounds of the eye and lids, especially if accompanied by extravasations of blood.

In a case of complete ptosis (right eye) from an injury by a piece of wood striking the eye, in which there was *ecchymosis of the lids and conjunctiva*, a complete restoration of power to the upper lid took place in five days under Ledum externally and internally, after Arnica had been used for two days with no benefit.

*Ecchymoses of the conjunctiva*, either of traumatic or spontaneous origin, are often quickly absorbed by the use of this remedy, and

in many cases more promptly than when our usual remedies, Arnica or Hamamelis, are employed.

A case of *hæmorrhage into the anterior chamber*, after an iridectomy, which had resisted both Hamamelis and Arnica for two weeks, was absorbed in four days under this drug, used externally and internally.

It is the remedy in asthenopia, if there is dull pain behind the eyeball, as if it would be forced out.

### LILIUM TIGRINUM.

Lachrymation. Burning feeling in the eyes after reading or writing; eyes feel very weak. Blurred sight with heat in the eyelids and eyes, extending back into head. Redness of edges of eyelids, and hot, sandy feeling in eyes on using at near work.

**Clinical.**—Favorable results have been obtained from Liliun in the relief of so-called asthenopic symptoms, which were in all probability dependent upon spasm of the accommodation.

### LITHIUM CARBONICUM.

Eyes pained during and after reading, as if dry. Uncertainty of vision and an *entire vanishing of the right half of whatever she looked at*; or if two short words occurred in succession, that on the right hand was invisible. Pain and heaviness over brows, worse toward evening.

**Clinical.**—A brilliant cure of hemiopia with Lithium<sup>30</sup> is reported by Dr. Dunham, in which only the left half of an object was visible with the right eye and nothing at all with the left. In two or three other cases of hemiopia, in which only the left half of object was visible, no benefit was derived from this remedy.

It may be of service in some cases of asthenopia.

### LYCOPODIUM.

**Objective.**—Swelling and painfulness of the lids, with nightly agglutination of the canthi. Styes on the lids, toward the inner canthus. *Ulceration and redness of the eyelids*; the water which flows from the eye smarts and bites the cheek. Inflammation of the eyes, with itching in both canthi, redness and swelling of the lids of the right eye; distressing pain, as if they were dry, with nightly agglutination.

**Subjective.**—Eyelids dry, with smarting pain; they cannot be opened, even on rubbing, in the morning. Smarting and burning of the lids. Dryness of the eyes in the evening and at night. Eyes dry and dim. Eyes dry, difficult to open, with smarting pain, in the morning. Severe burning and itching in the eyes. Pressive pain in the eyes, as if dust were in them. Stitches in the eyes. Itching in the canthi.

**Vision.**—Vision weak, is unable to distinguish small objects as well as formerly. *The evening light blinds him very much; he cannot see anything upon the table.* A veil and flickering before the eyes after the afternoon naps. Hemipopia: he sees only the left half of an object; same with one eye as with both, but worse with the right. Sensitiveness of the eye to daylight. Floating black spots before the eyes at a short distance.

**Clinical.**—External diseases of the eye are not commonly amenable to this drug, as its chief remedial power has been exhibited in the disorders of nutrition and function of the deep seated structures.

Ciliary blepharitis and hordeola occasionally call for the use of *Lycopodium*.

The progress of cataract has been arrested by this remedy when prescribed for chronic dyspeptic symptoms.—T. F. A.

Opacities of the vitreous have occasionally been known to disappear during the administration of *Lyco*.

Hemipopia, in which the right half of the field of vision was obscured, has been improved.

In *Hemeralopia* its great value as an eye remedy becomes apparent, for no other drug in our *Materia Medica* has cured such a large number of cases as *Lyco*. There seems to be no marked indication for its use, with the exception of the night blindness coming on in the early morning, though in some instances it was found that the patient could see better at a distance than near at hand, yet in other cases this indication was wanting, so it cannot be considered important. If black spots floating before the eyes accompany the night blindness this drug is particularly called for.

### LYCOPUS VIRGINICUS.

**Clinical.**—This remedy is noticed here on account of its reputed power in the treatment of exophthalmic goitre (*morbus*

Basedowii). In my hands, however, it has failed to benefit in every case in which it has been given.

### MERCURIALIS PERENNIS.

**Objective** —Blinking of the eyes in the open air and sunlight. Twitching of the upper lids, especially of the left eye. Watery eyes. Pupils dilated.

**Subjective.**—On waking at night she was unable to open the lids immediately; they seemed paralyzed and could not be opened until she had rubbed them. Weakness of the upper lids, so that at times she could not completely raise them. *Lids heavy and dry. Dryness of the eyes. Burning in the eyes. Pain in the eyes while reading and writing.* Bruised, sore feeling of the eyes, with sensation as if they were too large for their sockets or as if they would be pushed out.

Vision foggy. Weakness and sensitiveness of the eyes to bright and artificial light. Blinking of the eyes while sewing or reading by the light. *Letters run together while reading.*

**Clinical.**—Hyperæmia of the conjunctiva after using the eyes with heaviness of the lids will often find its remedy in Mercurialis.

Our attention should be more frequently directed toward this drug in the treatment of *asthenopia*. It is especially indicated if the patient complains of a sensation of dryness in the eyes and heaviness of the lids. (Compare with Alumina.) The sensation as of a mist before the eyes in the morning, and a burning pain in the left eye, worse in the evening and after using, occurring in cases of asthenopia, have also been relieved. Also the hyperæmia of the conjunctiva, already noted, should suggest this remedy in these cases.

### MERCURIUS CORROSIVUS.

Redness of both ocular and palpebral conjunctiva. *Inflammation of the eyes.* Pupils insensible to light. Thin and acrid mucopurulent discharges.

*Eyes painful. Burning in the eyes. Tearing as if in the bone above the left eye,* near the root of the nose, and in other parts of the bone. Pain behind the eyeballs as if they would be forced out. *Photophobia.* Lachrymation profuse, burning and excoriating.



**Clinical.**—The corrosive sublimate is more often indicated in severe inflammatory conditions of the eye, especially superficial, than any other form of mercury.

In certain forms of blepharitis it is frequently very valuable, as an inflammatory swelling of indurated lids; inflammatory swelling of the cheeks and parts around the orbits, which are covered with pustules, or in scrofulous inflammation of the lids, which are red as in erysipelas. In these cases the lids are usually *very red and excoriated by the acrid lachrymation, and the pains are very severe, particularly at night.*

Chronic catarrhal conjunctivitis, tending toward trachoma, with redness and excoriation of the lids, and a dull feeling, with itching in the eyes in the evening, has been cured under this remedy.

Merc. corr. is usually more useful in *strumous ophthalmia* than Merc. sol. It is chiefly called for if phlyctenules, ulcers, or even deep abscesses are formed in the cornea, for then the severity of the symptoms would lead us to its selection, as this remedy is especially indicated in the erethistic form of inflammation. The eye is usually very red and the cornea vascular and ulcerated. The cornea may have become so weakened from the inflammation as not to be able to resist the normal intra-ocular pressure and so commencing staphyloma may be noticed. The *photophobia is excessive and the lachrymation profuse*, which, together with the *ichorous discharges are acrid, excoriating the lids and cheek.* The pains vary in character, though are generally very severe and not confined to the eye, but extend into the forehead and temples; always worse at night. The lids are much swollen, erysipelatous, œdematous or indurated; are red and excoriated from the acrid discharges and are spasmodically closed, rendering it almost impossible to open them and they often bleed easily upon attempting to do so. There are also usually present pustules on the cheek around the eye, soreness and excoriation of the nose, enlargement of the cervical glands, coated tongue, etc.

It has been employed with benefit in *ophthalmia neonatorum* in which the discharges were thin and excoriating, especially if the mother has gonorrhœa or syphilitic leucorrhœa.

Episcleritis, with *much pain in and around the eye at night*, requires Merc. corr.

For kerato-iritis it is one of our chief remedies.

In *iritis*, especially the syphilitic variety, it no doubt surpasses any other remedy in frequency of indication, and by some it is even considered a specific, providing atropine is used at the same time locally. The severity of the symptoms and the intensity of the pains at night over the eyes and through them, through the head and in the temples, are our chief indications. *It is no less useful in the other forms of plastic iritis*, as every-day experience fully verifies.

Hypopyon occurring in the course of abscess of the cornea or iritis has been frequently absorbed under its use.

If the inflammatory process has extended to other portions of the uveal tract (cyclitis, choroiditis, irido-cyclitis or irido-choroiditis) this remedy still deserves special prominence.

In *retinitis albuminurica*, no remedy has been employed with better success in such a large number of cases; the inflammatory process is often seen to rapidly subside, and the exudations into the retina disappear under the influence of this remedy. The prescription is chiefly based upon the pathological changes, as the symptoms are so few in this disease.

In *retinitis hæmorrhagica* Merc. corr. is of great value in hastening the absorption of extravasated blood and in toning up the walls of the vessels so as to successfully resist further blood pressure.

In superficial inflammations of the eye, Mercurius closely resembles several remedies, as Graph., Euphras., Arsen. and Sulph., but the severity of the symptoms and nightly aggravations are much more marked under Merc. than either of the above. Under Graphites the discharges are also acrid and excoriating and the photophobia often intense, but the pains are not usually so severe as under Merc. Besides we usually find the external canthi cracked and a moist eruption on the face and behind the ears when Graph. is indicated. The acrid discharges of Euphrasia are generally thick, while those of Mercurius are thin. The character of the pains and general cachexia will serve to distinguish it from Arsen. and Sulph.

### MERCURIUS DULCIS.

**Clinical.** — Ciliary blepharitis associated with phlyctenular ophthalmia and accompanied by eruption on the face, soreness of

the nose and swelling of the upper lip, is often amenable to Merc. dulc.

Calomel has been employed for many years by the old school in scrofulous ophthalmia, and even to this day it is considered by them as one of the most important remedies, though not a specific as was formerly supposed. Dusting the fine powder in the eye is the manner in which it is used by them.

We also, as homœopaths, find it adapted to certain forms of *strumous ophthalmia*, though given in a different manner, in different doses under different principles. We use it only internally and for the general cachexia, as the following case will illustrate: A little girl, æt. 6, light complexion, pale skin, muscles soft and flabby, glands enlarged and general strumous diathesis. Upon examination a very deep ulcer of the left cornea was seen which had so nearly perforated that the membrane of Descemet had begun to bulge; small ulcers and pustules were present at the border of the cornea. In the right eye pustules and maculæ of the cornea were also found. There was *considerable redness and great photophobia*. Various remedies, chiefly the anti-psorics, had been given with no benefit; Merc. dulc.<sup>2</sup>, three doses daily, was administered; improvement soon began and went rapidly on to recovery, leaving only a macula behind.

Benefit has also been derived from the use of Merc. dulc. in deeper forms of inflammation of the eye, as in irido-choroiditis, especially if dependent upon a scrofulous diathesis, and the general cachexia of the patient suggests the remedy.

### MERCURIUS IODATUS FLAVUS.

**Clinical.**—Dacryocystitis blennorrhœa may call for this remedy, though it is not often indicated.

In some cases of blepharitis of syphilitic origin favorable results have been obtained from Merc. prot., if the concomitant symptoms point to its use.

It has been of service in uncomplicated granular lids, but is more particularly adapted to trachoma with pannus. It may be indicated in all stages of pannus, but especially in acute aggravations after the first, or Aconite stage has passed. In these cases it often exerts a marked beneficial influence upon the trachoma itself. (Special indications have been given after ulceration of the cornea, page 248).

Merc. iod. flav. has been useful in pustular inflammation of the cornea and conjunctiva, but its principal sphere of action is in *ulceration of the cornea*, especially in that form of ulceration which commences at the margin of the cornea and *extends, involving only the superficial layers, either over the whole cornea or a portion of it, particularly the upper part*, which appears as if chipped out with the finger nail, the so-called serpiginous form. Also in cases of *ulceration occurring in the course of pannus and granular conjunctivitis* it is excelled by no other remedy in frequency or indication.

In all these cases there is usually present excessive photophobia and redness, though sometimes these may be nearly absent. The pains are generally of a throbbing, aching character, *worse at night*; the pain often extends up into the head, which is sore to touch. In nearly every case we have the *thick yellow coating at the base of the tongue* and swelling of the glands in parts of the body, which are so prominent under this drug.

Benefit has been derived from this preparation of Mercury in syphilitic iritis, although it is not as frequently required as Merc. corr.

In intra-ocular trouble Dr. Woodyatt has observed very favorable results from the use of iodide of mercury, as in opacities of the vitreous and in irido-choroiditis.

Cases of paralysis of the oculo-motor nerve of syphilitic origin have been cured by this preparation of mercury as is markedly shown in the following case: A young man appeared for treatment with complete paralysis of all the fibres of the third pair of nerves of the right eye. It was probably of syphilitic origin, as fifteen months previously he had had a chancre which was followed by pain in the bones, worse at night, sore throat, etc. Kali iod., in material doses for three weeks and Rhus tox.<sup>1</sup> for one week, together with electricity all the time, failed to improve. After three days' use of Merc. iod. flav.<sup>30</sup> and electricity, the power began to return to the muscles so that he could raise the upper lid somewhat, and in less than a month he was fully restored.

### MERCURIUS IODATUS RUBER.

**Clinical.**—The action of this form of mercury is very similar to that of the yellow iodide and by some is used instead of the latter.



Its usefulness has been especially verified in trachoma and pannus, though the points of difference between the two iodides in this affection are not known.

### MERCURIUS NITROSUS.

**Clinical.**—The nitrate of mercury has been successfully employed, both externally and internally, in various forms of blepharitis with no particular indications.

As a caustic in syphilitic ulceration of the lids, there is none better.

This preparation of mercury is more often indicated than any other in *pustules and ulcers of the cornea*, particularly the former. It has been especially used by Dr. Liebold with remarkable success in a large number of cases, without regard to symptoms. Severe cases as well as mild, chronic cases as well as acute, and superficial as well as deep (even with hypopyon) have yielded to its influence; also in some cases there has been much photophobia, in others none at all; in some, severe pain, especially at night, while in others it has been nearly absent, and thus we might go through a variety of other symptoms, differing as much as the above, in which this drug has been curative. It has usually been employed both externally and internally at the same time and in the lower potencies; about the first potency ten grains to two drachms of water (or even stronger) as an external application, to be used in the eye two, three or more times a day, and the second or third potency to be taken internally. It may, however, be given internally alone with success.

### MERCURIUS PRÆCIPITATUS FLAVUS.

**Clinical.**—Dr. W. P. Fowler writes of this remedy as follows: “The yellow oxide of mercury is a remedy from which I have obtained very favorable results in marginal blepharitis. It has proved most beneficial where the edges of the lids were red, covered with fine crusts and slightly thickened. Where there is ulceration of the lids of an indolent nature, it is also efficacious. I have prescribed this remedy in the 6th trit. and applied it locally, prepared according to the formula:

R. Hydrarg. oxyd. flav.,	.	.	.	.	.	.	gr. viii
Vaselin	.	.	.	.	.	.	ʒi

“ Every night a little of the ointment should be applied with a camel’s hair brush to the roots of the lashes. Before making the application, the margins of the lids should be thoroughly washed with warm water, all the crusts removed and the lids then carefully dried. Unless this precaution be taken, little, if any, benefit will follow.” Dr. C. M. Thomas also says, “ I find the yellow oxide of mercury (1 gr. to ʒi cosmoline) far more effectual than Graphites or Merc. nitr., in blepharitis.” The latter prescription of Merc. præc. flav. I have also found especially beneficial in ciliary blepharitis.

### MERCURIUS PRÆCIPITATUS RUBER.

**Clinical.**—The red precipitate of mercury, so often used by the old school, has been too little employed by us, as we have no symptomatology, but are guided in its selection simply by clinical indications.

In scrofulous ophthalmia it has proved beneficial. There is commonly bright red swelling of the conjunctiva; the lids may be everted and granular; the cornea is superficially ulcerated and covered with vessels; the discharges from the eye are copious and purulent, forming crusts upon the lids which are firmly agglutinated in the morning; the photophobia is usually great; the symptoms are aggravated by working over a fire.

Benefit has been derived from its use in ophthalmia neonatorum.

In trachoma with pannus it is a valuable remedy. It is rarely of much service in the acute stage, for it is especially adapted to old chronic cases, in which the cornea is covered with pannus of high degree, with considerable redness, discharge and photophobia; granulations may be present, or may have been already removed by caustics.

### MERCURIUS SOLUBIS.

**Objective.**—*The upper lid is thick and red, like a sty.* Great swelling, redness and constriction of the lids, which were very sensitive to touch. Eyelids agglutinated in the morning. He is unable to open the eyes well, as if the eyeballs were agglutinated (to the lids). Inflamed swelling in the region of the lachrymal bone. Inflammation of both eyes, with burning pain, worse in the open air. The eyes were forcibly drawn together, as if long deprived of sleep. Lachrymation.

**Subjective.**—A sensation as of a cutting substance beneath the left upper lid. Heat, redness and pressure in eyes. Burning in the eyes. Burning and biting in the eyes, as from horse-radish.

**Vision.**—If she attempts to look at anything she cannot distinctly recognize it, and then the eyes are almost always involuntarily drawn together; the more she tries to restrain the contraction the less able is she to prevent it, she is obliged to lie down and close the eyes. A fog before one or both eyes. Dimness of vision. The eye cannot tolerate the firelight or daylight. *Fire-light blinds the eyes very much in the evening.* Things like black insects constantly float before the vision.

**Clinical.**—Mercurius solubis has for many years been one of the most prominent remedies in ophthalmic practice, and even now it may be considered one of the polychrests.

*Inflammation or Blenorrhœa of the Lachrymal Sac* should suggest this remedy; if there is considerable swelling and pain at night, or if the discharge is thin and acrid in nature, providing the general condition of the patient at the same time calls for it. For fistula lachrymalis, with external ulceration resulting from syphilis, it has also proved useful.

In *blepharitis* there is no better remedy if the lids are *red, thick and swollen* (particularly the upper) *and sensitive to heat*, cold or touch. The lachrymation is *profuse, burning and acrid*, making the lids sore, red and painful, especially worse in open air or by the constant application of cold water. *The symptoms are all worse at night in bed and by warmth in general, also from the glare of a fire*, which is unusually painful. It is especially indicated in ciliary blepharitis caused by working over fires or forges, or by gaslight.

Ophthalmia neonatorum, marked by acrid discharge (usually thin) which makes the cheek sore and particularly if caused from syphilitic leucorrhœa in the mother, is more quickly relieved by this drug than any other.

In *superficial inflammations of the cornea and conjunctiva*, either ulcerative, phlyctenular or catarrhal, Mercurius has proved especially serviceable. We are led to its use by the following symptoms, which have been collected from a large number of cases: In inflammatory conditions dependent upon syphilis, either hereditary or acquired, it is one of the first remedies to be thought of. The

ulcers of the cornea are usually quite vascular, though they may be surrounded by a grayish opacity and complicated with existence of pus between the layers of the cornea (onyx). The redness of the conjunctiva is variable, though more frequently of high degree; in some cases chemosis. *The dread of light is generally very marked*, in some cases so intense that the eyes can hardly be opened, even in a darkened room, and is more often *aggravated by any artificial light, as gaslight or glare of a fire*. The lachrymation is profuse, *burning and excoriating* and the muco-purulent discharges are very *thin and acrid*. The pains are generally severe and varying in character, but are more frequently tearing, burning, shooting or sticking, and are not confined to the eye, but extend up into the forehead and temples; and *always worse at night*, especially before midnight, from heat, damp weather or extreme cold, and are often ameliorated temporarily by cold water. The lids may be spasmodically closed, are thick, red, swollen, even erysipelatously, *excoriated by the acrid discharges and are sensitive to heat*, cold or contact; there is usually biting and burning in the lids, sometimes a feeling as if there were many fiery points in them; worse in the open air. The general aggravations in the evening by gaslight and at night after going to bed are of the first importance. At the same time the concomitant symptoms of soreness of the head, excoriation of the nose, eruptions on the face, condition of the tongue, offensive breath, night sweats without relief and pain in the bones, especially at night, would lead us in its selection.

*Keratitis parenchymatosa* dependent upon hereditary syphilis very frequently calls for Mercurius, which has proved extremely valuable in this affection. It may also be of service in interstitial inflammation of the cornea, if traceable to acquired syphilis, as was verified in a case recently under treatment.

Kerato-iritis, both with and without hypopyon, has been cured with Merc.; it is indicated by the pains and nightly aggravation. In one case in which benefit was derived the pain was very severe at night, the eye feeling as if it were a ball of fire, the lachrymation was hot and hypopyon was present.—T. F. A.

In the treatment of episcleritis it should be considered with Thuja.

Mercury has always been and probably always will be the prin-



cial remedy for *iritis*. The solubis has been employed with great success in many cases, though it is not as commonly useful as the corrosivus. It is especially called for in the *syphilitic* variety and when gummata are present in the iris, though its sphere of usefulness is not confined to this form, as it may be indicated in the rheumatic or any other form of *iritis*, in mild cases as well as severe, when hypopyon is present and when it is absent. The usual symptoms of *iritis*, contraction, discoloration and immobility of the iris, ciliary injection, haziness of the aqueous, etc., are of course found, but the characteristic indications are to be looked for in the pains, which are usually of a *tearing, boring character, chiefly around the eye, in the forehead and temples, which are often sore to touch*; with this there may be throbbing, shooting and sticking pains in the eye; all of which are always *worse at night*.

In retinitis or in choroiditis, particularly if dependent upon syphilis, this remedy has been employed with benefit. In these cases the retina is often very sensitive to the glare of a fire. It is the great remedy for *diseases of the optic nerve and retina occurring in workers in foundries*.

#### MEZEREUM.

Obstinate jerking of the muscle of the left upper lid. Lachrymation, with biting in the eyes. Eyes hot, inflamed, on rising in the morning; the conjunctiva of the ball very much injected, dirty red, especially in the vicinity of the external canthus; most in the left eye; with pressive pain and a sensation of dryness. Much pressure in the eyes, with a sensation of dryness, as if the conjunctiva of the lids were much inflamed. Smarting in the eyes, compelling to rub them. Pressive pain above the left eye. Itching, biting on the margin of the lids and skin near the nose.

**Clinical.**—In eczematous affections of the lids, face and head, characterized by *thick, hard scabs from under which pus exudes on pressure*, Mezereum is especially useful. It has been given with benefit in blepharitis, pustular conjunctivitis and abscess of the cornea, chiefly when these symptoms have been present.

Ciliary neuralgia, especially after operations upon the eye, has been relieved by this drug.

#### MURIATICUM ACIDUM.

**Clinical.**—The following symptom, found in a case of muscular

asthenopia, was speedily relieved by Muriatic acid: Sharp burning pain extending from the left to the right eye in the morning, ameliorated by washing. Vertigo worse on moving the eyes.

### NAPHTHALIN.

In the *Berliner Klinische Wochenschrift*, No. 44, 1887, there is reported the changes occurring in the eyes of animals who were fed naphthalin. When the drug was given in large doses, from thirty to forty grains, the results come on rapidly, with sometimes detachment of the retina; in smaller doses the process was much slower. The fundus was filled with numerous small brilliant points, which seemed to be formed as a large, white plaque, usually below the optic disc, and which in extending covered over the choroidal vessels. The same brilliant spots were seen in the optic papilla. The most important changes were seen in the lens, which showed a turbidity extending from the posterior surface and the borders, increasing so rapidly that within two days the whole posterior surface was dim. There were also opaque radiating striæ coming from the borders of the lens. The author believed the haziness to be due to an exudation between the capsule and the lens and also between the lens fibres.

From the experiments upon animals Naphthalin has been frequently tried to arrest the progress of cataract, but so far as known at present with little or no success.

### NATRUM CARBONICUM.

He could hardly open the lids; they involuntarily closed. Small ulcers about the cornea, with stinging pains in the eye, so that he was obliged to shade it from every ray of light. Needle-like stitches in both eyes, after dinner. Heaviness of the upper lid.

Eyes dim; he was constantly obliged to wipe them. Black, floating spots before vision while writing. Blinding lightnings before the eyes on waking.

### NATRUM MURIATICUM.

**Objective.**—Redness of the margins of the lids; in the morning the eyes were agglutinated with scabs. A catarrhal affection of the margins of the lids developed; *they become red with burning,*

*especially in the evening while reading; secreted mucus and were agglutinated in the morning on waking and covered with thick scabs. Spasmodic closure of the lids. Irritability of the margins of the lids and their conjunctiva. Lachrymation in the open air. Acrid lachrymation, which makes the canthi red and sore. Redness of the white of the eyes, with lachrymation. Redness and inflammation of the white of the eye, with a feeling as if the balls were too large and compressed. Inflammation of the eyes and lachrymation in every slight wind. Giving out of the eyes. The eyes give out on reading or writing; with a pressure in the right eye, extending into the head, disappearing on walking about the room.*

**Subjective.**—Slight pressive pain above the eyebrows. Sensitive dry sensation in the eyes, as after weeping a long time, while riding in a carriage. Pain as from a foreign body in the eye. Burning in the eyes, with increased secretion of mucus; the lids are agglutinated in the morning, with great sensitiveness to lamplight. Violent burning in the eyes in the evening. *Pressure in the eyes on looking intently at anything.* Sticking in the right eye. Sensitiveness of the eyes. Smarting pain in the eyes. *Sensation as if sand were in the eyes in the morning.* Itching in the eyes. Itching in the inner canthi and lachrymation.

**Vision.**—Eyes dim and weak. Vision not as clear as usual; the eyes seem misty all day. Objects seem covered with a thin veil. On looking at anything, especially on sewing, sudden darkness before the eyes; she could see nothing till she directed the eyes to another object, at 6 P. M., with sleepiness. *Unsteadiness of vision; objects become confused on looking at them. Letters and stitches run together,* so that she cannot distinguish anything for five minutes. Small fiery points before the eyes wherever she looks.

**Clinical.**—Natrur mur. has been successfully employed in a variety of ophthalmic affections, both superficial and deep. It is better adapted to chronic diseases than to those which are more acute in their course.

Well authenticated cases of morbus Basedowii are reported to have been permanently relieved by this remedy. It is, therefore, mentioned in this place, though my own experience has not verified the indication.

Stricture of the lachrymal duct, fistula and blenorrhœa of the lachrymal sac, in which the diagnosis cannot be questioned, have been benefited by this remedy.

It is very useful in certain forms of *blepharitis* in which the thick, inflamed lids smart and burn, with a sensation of sand in the eye and acrid lachrymation which excoriates the lids and cheek, especially if caused from caustics.

Dr. F. H. Boynton first called attention to Natrum mur. as a valuable remedy for *follicular conjunctivitis*. It is useful in this form of inflammation of the conjunctiva, in which the follicular formations are chronic and chiefly confined to the oculo-palpebral folds. It has also been of service in these cases when complicated with true trachoma.

Old cases of granular lids, with or without pannus, may require this remedy, especially if they have previously been "much treated" with caustics and are accompanied by acrid, excoriating lachrymation.

In *pustules and ulcers of the cornea* much benefit is frequently derived from the administration of Natrum mur., especially in *chronic recurrent cases*, though the symptoms which lead to its selection are not particularly characteristic. There may be itching and burning in the eyes or a feeling as from sand in them, usually worse in the morning and forenoon. The pains vary in character, though are not severe, with the exception of a *sharp pain over the eyes on looking down*. *The lachrymation is acrid and excoriating, making the lids red and sore; the discharges from the eye are also thin, watery and excoriating* (Merc., Arsen.). The photophobia is usually well marked and the lids are spasmodically closed. *The skin of the face around the eye is often glossy and shining, while the lips may be sore and the corners of the mouth cracked*.

Hyperæsthesia of the retina has been relieved, in which there was much lachrymation and burning in the morning, with some conjunctival injection; also in cases in which, on looking at a bright light, there was great photophobia, severe sticking in the temples and, on reading, objects seemed to swim before the sight. It is especially indicated in chlorotic females.

In *asthenopia*, particularly muscular, and dependent upon over-use of the eyes, in either *ametropia* or *emmetropia*, Natrum mur. is a most important remedy. By reference to the verified symptom-



atology of this drug, it will be seen how closely indicated it is in a large majority of asthenopic troubles, In addition to which many clinical indications have been observed, as follows: *Drawing, stiff sensation in the muscles of the eyes on moving them* (this is very characteristic of Natr. mur.). *Pain, burning and smarting of the eyes on attempting to use them and after using them.* *Heat* and a feeling as though there was a rush of blood to the eyes. *Pain on looking steadily at distant or near objects.* Severe pain over the right internal rectus muscle (BUFFUM). Use of the eyes brings on *heaviness* and drooping of the lids; causes letters or sketches to blur and, if continued, produces aching in the balls; lamplight is particularly troublesome; retinal images are retained; right lower lid twitches a great deal (WOODYATT). Lids smart and feel heavy on slight use of eyes, we desire to rub them; sharp shooting pains in the globe; blurred vision; constant dull aching pain in the globes; photophobia, especially to gaslight (WOODYATT). *Headaches* coming on in the morning, often before rising, beginning in one eye with a sensation as if the eye would be pressed out, accompanied by nausea and vomiting; when looking down, objects appear larger than when looking forward (BUFFUM). Together with the above symptoms, marked *weakness of the internal recti muscles* will usually be found, though in some cases the weakness of the ciliary muscle will be more pronounced. A corresponding decrease in the acuteness of vision is frequently observed and remedied by the use of Natr. mur.

#### NATRUM SALICYLICUM.

**Clinical.**—The salicylate of soda, although an empirical remedy, often renders valuable service in relieving *severe pain in and around the eye.* In severe cases of iritis and other diseases it may not only relieve the ciliary neuralgia, but also have a beneficial influence over the progress of the disease. Its use has been particularly noted for the relief of the pain of iritis following severe operations, as cataract extraction. From three to five grain doses, repeated from one to three hours or even oftener in some cases, will usually be found necessary.

#### NATRUM SULPHURICUM.

Both eyes agglutinated in the morning, with photophobia.

**Clinical.**—As a local application in maculæ of the cornea it has

seemed to hasten the absorption of the new elements and clear the cornea.

### NITRICUM ACIDUM.

Yellowness about the eyes, with red cheeks. Difficulty in opening the eyes and raising the upper lid in the morning. Eyelids swollen, hard, smart and burn.

Burning, biting and stitches in the eyes. *Photophobia*.

**Vision.**—Double vision of horizontal objects at some distance. Obscuration of the eyes while reading. She can clearly distinguish nothing at night and everything seems double. Shortsighted; objects at a moderate distance were indistinct. He was obliged to stop reading in the twilight sooner than usual.

**Clinical.**—Nitric acid is of especial importance in diseases of the eye of syphilitic origin, or if the patient has been over-dosed with mercury or potash.

In one case of gonorrhœal ophthalmia, in which the discharge was profuse and cornea ulcerated, with burning pain, favorable results were obtained from Nitric acid<sup>3</sup> internally and a weak solution externally.

More benefit has been derived from this remedy in *syphilitic iritis* than in any other ophthalmic disease. It seems to be adapted to those cases which are chronic in their course and unaccompanied by the customary nightly pain, or this pain is very mild in comparison with the usual iritic pains; sometimes the pain may be more severe during the day than at night. Posterior synechiæ, often very firm, will usually be found when these patients appear for treatment.

### NUX MOSCHATA.

Blue rings around the eyes.

*Sensation of dryness in the eyes;* reading by artificial light was difficult; the *eyes would close from sleep;* the head and forehead were dull in the evening. Sensation of fullness in eyes.

Everything looks too large. Lids heavy and stiff.

**Clinical.**—Dr. D. J. McGuire sends me the report of a "case of episcleritis in a delicate girl of ten years, involving both eyes. The nodule over each external rectus was very large and very painful, had existed two weeks and was growing worse daily.

The child was very sleepy, with dry lips and tongue, and had a tired, sleepy expression. Gave *Nux mosch.*<sup>30</sup> every three hours the first day, then three times daily. After three days, as she was much relieved, gave blank powders for two days, during which time the patient became worse. Returned to *Nux m.* with prompt relief and a cure in twelve days."

### NUX VOMICA.

**Objective.**—Twitching of the eyelids. Blinking of the eyes. Swelling of the eyes, with red streaks in the whites and pressive-tensive pain. Inflammation of the eyes. The eyes run water, as in a moist inflammation of the eyes or as in stopped coryza. While yawning, in the morning, the eyes stand full of water, with lachrymation.

**Subjective.**—The margin of the lid is painful, as if rubbed sore, especially on touch *and in the morning*. Pressure in the upper lids especially *in the morning*. The canthi are painful, as if sore. *A smarting dry sensation in the inner canthi, in the morning, in bed.* Biting in the eyes, especially in the external canthi, as from salt, with lachrymation. Itching in the eyes, relieved by rubbing.

**Vision.**—Vision extremely sensitive. *Vision cloudy. Intolerance of the daylight, in the morning*, with obscuration of vision. *Photophobia.* Glittering appearance with black and gray points before eyes.

**Clinical.**—The power of *Nux vomica* to relieve nervous irritability has led to its beneficial use in diverse affections of the eye, as the following clinical record will show.

In dacryo-cysto-blenorrhœa good results have been obtained from its use.—A. WANSTALL.

In ciliary blepharitis, with smarting and dryness of the lids, *especially in the morning*, our remedy will be found in *Nux vom.* It is also indicated in ciliary blepharitis dependent upon certain forms of gastric disturbances.

From its action in spasmodic affections we are led to its use in blepharospasm or morbid nictitation, in which it has been given with benefit, though it is not so frequently indicated as *Agaricus*.

As a remedy for conjunctivitis, it is not as often called for as when the cornea becomes involved, though in both catarrhal and scrofulous inflammation of the conjunctiva benefit has been de-

rived, especially if there is marked *morning aggravation* and the usual concomitant symptoms. In acute conjunctivitis with hæmorrhages in the conjunctiva it is also sometimes indicated.

Good results were obtained from its use in ophthalmia neonatorum, in which the lids were much swollen, bled easily and the child was troubled with vomiting, constipation and flatulent colic.

Old cases of trachoma, especially if complicated with pannus and if they had much treatment, are often benefited by this remedy. It is, however, frequently of use, either to commence the treatment or as an intercurrent remedy in trachoma with or without pannus, though it rarely effects a cure unassisted by any other drug. It has been of service in trachoma and follicular conjunctivitis occurring only in the summer and worse in the morning (compare Sepia).

Nux vom. is frequently indicated in *ulcers* and *pustules* of the cornea, especially the former, *with excessive photophobia*. An important point regarding the photophobia, as well as the other symptoms, is the *morning aggravation*, which is rarely absent. In addition to this we usually have much lachrymation and a variety of pains, none of which, however, can be said to be very characteristic, though the following are a few which have been relieved: Sharp darting pains in the eye and over it, in some cases extending to the top of the head and always worse in the morning. Burning pain in the eyes and lids. Tearing pain in the eye at night, awakening from sleep. Eyes feel pressed out whenever she combs her hair. Sensation as of hot water in the eye. Pain in the lower lid as if something were cutting it. Burning pain when looking at a light, darting upward above the eyes, with pain in the eyebrow on going to bed. *Pain in the eyes in the morning*. Sometimes relief from the pain is obtained by bathing the eyes in cold water.

It has proved useful in iritis, as in one case of the syphilitic variety, with moderate ciliary injection, some photophobia, hot lachrymation, morning aggravation and great sensitiveness to the air, though it cannot be often indicated.

Even after the deeper structures have become inflamed, benefit has been derived from Nux vom., as in a case of chorio-retinitis, in which there was much throbbing pain, especially in the left eye and in the morning, ball sore to touch, upper part of the sclera



bright red, burning pain in the eye not relieved by bathing and aggravation of the symptoms on lying down.

Of late years strychnia has been employed very extensively by the old school in the treatment of atrophy of the optic nerve and various forms of amblyopia. It is used chiefly by hypodermic injection, and in many cases with marked success. We also often find *Nux vom.* useful in atrophy of the optic nerve, checking the progress of the disease and in many cases restoring the vision to a limited extent, though it is, of course, impossible to restore the sight wholly if genuine atrophy has once commenced.

In *amblyopia potatorum*, or impairment of the vision due chiefly to the use of intoxicating drinks, or even to dissipation in general, no remedy will more frequently restore to power the function of the benumbed nerve than this.

*Tobacco amaurosis* or *amblyopia* will also often be benefited by the use of *Nux.*

Dr. Boyle reports a case of *retro-bulbar neuritis* in a young girl where the loss of vision occurred suddenly; two weeks later when first seen the vision was  $\frac{2}{10}$ . The ophthalmoscope showed nothing abnormal in the fundus, the field for white normal, but for red very much contracted. There was soreness of the eyeball on pressing it backward, and the patient complained of feeling much worse in the mornings. *Nux vom.* was given and in three days the vision was improved to  $\frac{2}{10}$  and field for red nearly normal.

Its action upon the muscles should not be overlooked, for though it is not often called for in strabismus, still it has benefited some cases, periodic in character, especially aggravated by mental excitement or when caused by an injury.

For paralytic affections of the muscles it may sometimes be useful, especially when *caused or made worse by stimulants or tobacco.*

Very favorable results have followed the use of this drug in asthenopia, especially when the symptoms are more pronounced in the morning; also when aggravated by stomach derangements.

### ONOSMODIUM VIRGINIANUM.

The following symptoms of this drug are taken from the proving by Dr. W. E. Green.\* The ophthalmoscope shows the optic

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\*Hahnemannian Monthly, 1885.

disc hyperæmic, and the retinal vessels engorged, worse in the left eye.

**Subjective.**—*Heaviness and dullness of the eyes.*—The eyes feel as though she had lost much sleep. Heaviness of the lids. Dull, heavy pains and soreness of the eyeballs. Eyes feel as though they were very wide open, and he feels as though he wanted to look at objects very far away. Far-off objects look large. It is disagreeable for him to look at objects near by. Tense, drawing and tired feeling in the ocular muscles. Pain in and over the left eye. Pain in the upper portion of the left orbit with a feeling of expansion. *Pains in the left side of the head and over the left eye* extending around the left side to the back of the head and neck. *Dull, heavy pains in the occiput pressing upward with dizzy sensations.* *Great muscular prostration and tired feeling over the entire body.* *The muscles feel unsteady and treacherous, as though you dare not trust them to move.* Vision impaired. Vision blurred.

We are reminded of *Cimicifuga* by the pains in the eyeball, and of *Kalmia* by the tense, stiff feeling of the muscles, but we miss the sharp, shooting pains of the latter. *Ruta* also bears a close relation to *Onosmodium*.

Symptoms are always worse on the left side, as shown by case reported by G. S. N.: Mrs. D. had suffered for several months with headaches, which for the last two weeks had been most intense, a constant dull, stupid ache, in the right occiput and eye, worse when tired or from any sudden motion. There was some vertigo and a strained feeling in the right eye. Under *Onosmodium*<sup>3\*</sup> all the symptoms were quickly relieved.

*This is one of our very best remedies in headaches from eye-strain and in muscular asthenopia.*

## OPIUM.

Pupils contracted.

Eyes dry and weak, with burning and a sensation as if dust were in them. Scintillations before the eyes. Sensation as if eyes were too large for orbits. Eyes half closed, red and burning.

**Clinical.**—The use of this drug in ophthalmology has been very limited, except as an anodyne.

Two very interesting cases are, however, presented, in which Opium acted very favorably: A woman, æt. 35, had been troubled with her eyes for six weeks. Upon examination, total paralysis of the accommodation with impaired sensibility of the retina of the right eye and partial paralysis of the accommodation of the left eye was found. It was supposed to be due to the use of a cosmetic, which probably contained carbonate of lead. The other symptoms present were as follows: Almost constant frontal headache, vertigo with darting pains from the occiput to the forehead, distressing feeling of emptiness in the stomach, especially in the morning, bowels constipated and a sensation of pain and constriction as of a band encircling her chest in the line of the pleura. Nux vom.<sup>2</sup> failed. Opium<sup>3</sup> cured.—W. A. PHILLIPS.

The second case was one of embolism of the central artery of the retina. The arteries were bloodless, veins engorged and stagnant and hæmorrhagic spots on the disc. Came on after a severe attack of neuralgia. The face was very red, numb and drawn to the right side; tongue protruded to the right side; speech was imperfect, nearly voiceless, except with effort; pain in the back. All the pains were on the right side. Under the use of Opium alone he gradually recovered not only his vision but also power over the paralyzed parts.—T. F. A.

### PARIS QUADRIFOLIA.

Some stitches through the middle of the eye. Jerking and twitching of the right upper lid. The eyeballs seem too large. Eyes feel heavy.

**Clinical.**—This drug produced a permanent cure of paralysis of the iris and ciliary muscle supposed to be due to an injury received two years previous. There was pain drawing from the eye to the back of the head, where there was a sore spot; even pressure with the finger would cause her to cry out. Many black, floating specks before the vision were present.

The following symptoms have also been relieved by Paris: *Pain in the eyes as if pulled into the head.* Double vision. Headache worse in the evening, with confusion of the whole forehead and sensation as if skin of the forehead were drawn together and the bones scraped sore, with inflamed lids, red margins and sensation *as if threads drew from the eye into the middle of the head.* Ten-

sion around the brow as though the skin were thick and difficult to wrinkle. "Feeling of contraction in the internal canthi."—DEADY.

### PETROLEUM.

**Objective.**—An inflamed swelling, as large as a pigeon's egg, in the inner canthus, like an incipient lachrymal fistula, together with dryness of the right side of the nose. Lachrymation. Conjunctivitis and blepharo-adenitis.

**Subjective.**—Burning and pressure in the inner canthus. Itching and dryness of the lids. Burning in the eyes and pressure, with dimness on exerting them. Itching and sticking in the eyes.

The visual power is weak.

**Clinical.**—In disorders of the lachrymal apparatus, especially blennorrhœa of the lachrymal sac, decided benefit has been derived from Petrol.; its choice depends mainly upon the concomitant symptoms.

Within the last few years the purified preparations of Petroleum, Cosmoline and Vaseline have been used to a great extent and with much benefit as external applications in cases of blepharitis; they prevent the formation of new scabs and the agglutination of the lids, besides seeming to exert a beneficial influence over the progress of the disease. At the same time the use of Petrol. internally is highly recommended, especially if indicated by the characteristic occipital headache, rough skin, etc. Cases in which ciliary blepharitis has resulted from conjunctivitis granulosa, also when it has been a sequela of small-pox, with smarting and sticking pains in the inner canthus, have been cured by this drug.

It is sometimes indicated in trachoma with pannus, especially when occurring in a scrofulous habit, with considerable white discharge from the eye and roughness of the cheek.

It may be called for in scrofulous ophthalmia, with muco-purulent discharge from the eyes, inflammation of the lid margins and burning, itching or sticking in the eyes and lids.

Iritis, with dull pulsating pain in the occiput, may require Petroleum.

### PHOSPHORICUM ACIDUM.

**Clinical.**—*The headaches of school children dependent upon over-use of the eyes* (asthenopia) are frequently amenable to Phos. ac.



### PHOSPHORUS.

Blue rings about the eyes. Even sunken. Pupils contracted. Eyes seem large. Ptosis and paralysis of muscles. Aching and boring pains in the eyes. Œdema of lids. Stiffness and heat in the eyes. Dull pain in the eyes after reading.

**Vision.**—He sees more distinctly in the morning and in the twilight, than during the day. Giving out of the eyes while reading. Letters look red when reading. She was obliged to hold objects near in order to see distinctly; at a distance everything seemed enveloped in a smoke or mist; she could see better when the pupils were dilated by shading the eyes with the hand. Cloudiness or dimness of vision. Everything seems in a mist. A green halo about the candle-light in the evening. Flickering before the eyes and roaring in the head. Sparks before the eyes in the dark. It seems as though a black veil were before the right eye. Black floating points before the eyes. Dark objects and spots before the eyes.

**Clinical.**—Very little successful use of Phosphorus has been made in external affections of the eye. Its greatest sphere of action is to be found in diseases of the fundus, especially when the optic nerve and retina are involved.

In both disseminate and serous choroiditis benefit has been derived from the use of Phos. In these cases there will usually be found *photopsies or chromopsies*; in one case of choroiditis disseminata the latter were *red in color*.

There seems to be no question that Phos. is a valuable remedy in clearing up the vision and relieving many subjective symptoms in old cases of glaucoma after an iridectomy has been made, as illustrated by the following case: In a case of glaucoma after an iridectomy the patient suffered from a feeling as if something were pulled tight over the eye, with spangles (white) around the gas and a boring in the eye extending into the head. Phos. relieved the pulling sensation and headache and cleared up the vision.—T. F. A.

In both *hyperæmia* and *inflammation of the retina*, favorable results have been obtained from this remedy. In one case it relieved very quickly a congestion of the retina in which the balls were sore on motion, no photophobia, pains extending from the eyes to the top of the head.—T. F. A.

It may be called for in various forms of *retinitis*. It is especially indicated in *retinitis nyctalpica*. From its pathogenesis we are also led to believe that it will prove a valuable addition to our list of remedies for *retinitis albuminurica* and some experience seems to corroborate this view. The *degenerated condition of the blood-vessels found in retinitis apoplectica* not infrequently requires the use of Phos. It not only seems to aid in restoring the proper tone to the vessels, but also appears to hasten the absorption of the hæmorrhages. (Compare with *Crotalus* and *Lachesis*.) The hæmorrhages may be confined to the different layers of the retina or (as has occasionally been the case) may have extended into the vitreous. The inflammatory symptoms are not usually prominent, the impairment of vision and hæmorrhages into the retina constituting the chief symptoms. A hæmorrhagic diathesis will often accompany the eye indications (especially hæmoptysis).

The symptom of *cherry red color before the vision*, found in optic neuritis and other diseases of the fundus, has been frequently relieved by this remedy.

Benefit has been observed from its use in stopping the progress of cataract, as in the case of an old lady, with incipient and progressive hard cataract, in whose lens were hard, white, convergent striæ with diffuse haziness; she complained that on reading the *letters seemed as if printed in red ink*, although the paper looked white and natural. V.,  $\frac{5}{30}$ .<sup>8</sup> Under Phosphorus the haziness disappeared, no more striæ appeared and in six months the vision improved to  $\frac{13}{60}$ .—T. F. A.

Rapidly increasing myopia has been checked in its progress by this drug.—T. F. A.

In weakness of the internal recti muscles it has been found indicated, as in a case of *asthenopia muscularis*, in which there was pain and stiffness of the eyeballs on moving them and at times a feeling of heat in the eyes as after looking at a fire (*Nat. mur.*).—T. F. A.

### PHYSOSTIGMA.

SUBJECTIVE.—*Twitching of lids*. Drawing, twisting sensation in the eyes. Sharp, shooting and drawing sensation in the right eye. Eyes are sore and give pain when moved from side to side. Intolerable pain over both orbits. Eyes smart; lids feel sore.

Felt film over the eyes and blur; objects mixed; after which dull pain over the eyes and between the eyes. Eyes feel weak. Pain in the eyeballs. *Contraction of the pupils. Spasm of accommodation, which may be irregular*, producing astigmatism. *Muscae volitantes*. The accommodation recovers before the pupil.

**Clinical.**—Calabar bean being one of our most prominent myotics and antagonistic in its action to atropine, has been often employed to overcome the ill effects of atropine when used for purposes of examination, etc. Its action, however, is so short that frequent instillations are necessary to thoroughly counteract the action of the mydriatic and its effects are often unpleasant.

It has been used as a mechanical aid in tearing adhesions of the iris, especially to the cornea. In cases of deep ulceration of the cornea when at the periphery it is used to contract the pupil, so that if perforation occurs the pupillary edge of the iris will not be drawn into the opening.

It has also been of service, used locally, in paralysis of the accommodation and dilatation of the pupils consequent upon loss of power of the oculo-motor nerve.

Its usefulness is not confined to its mechanical power, for when given internally upon physiological principles and according to the law of "similia" it is valuable.

Twitching of the lids should direct our attention to this drug, especially if combined with spasm of the ciliary muscle. In one case in which there was twitching around the eyes, patient could not read at all without much pain, frontal headache aggravated by any light, Physostigma gave quick relief.

Dr. W. H. Woodyatt, adopting the theory that myopia in a great majority of cases is due to spasm of the ciliary muscle or at least that its increase depends upon this cause, gave Physostigma 2d dec. in several cases with excellent results, often reducing the degree of myopia very perceptibly and even in some cases restoring the vision entirely. *The symptoms of irritation, pain after using the eyes, muscae volitantes, flashes of light, etc.*, which might lead us to suspect spasm of the accommodation, were usually present and were soon relieved; while in other cases no symptoms of irritation were to be perceived; still the administration of Physostigma was followed by favorable results. The above observations have been frequently verified in practice, though hardly to

the extent first reported by W. Its action in these conditions is very similar to Jaborandi, though I do not believe it be as commonly indicated as the latter in irritability of the ciliary muscle.

It has been useful in paresis of the accommodation after diphtheria and in muscular asthenopia.—J. H. BUFFUM.

### PHYTOLACCA DECANDRA.

Eyelids agglutinated and œdematous. Reddish blue swelling of the eyelids, worse on the left side and in the morning. Eyes inflamed. Lachrymation.

Aching pains along the lower half of the right orbit. *Pressure around the eyes in the afternoon as if the eyes were too large.* Smarting and sandy feeling in the eyes. Lids feel as if granulated and the tarsal edges have a scalded, hot feeling, as if raw. Dull aching pains in eyes, worse from motion, light or exercise. Photophobia.

**Clinical.**—There is a comparatively rare form of orbital cellulitis in which Phytolacca is a remedy of great value. The inflammation is slow in its course and not attended by severe pain. The infiltration into the cellular tissue of the orbit is very pronounced; *hard and unyielding to touch. The eyelids are reddish-blue, hard and swollen.* The eyeball is pressed forward and its mobility impaired or lost entirely. There is chemosis and more or less dull, aching pain, lachrymation and photophobia.

It has been employed with some success in ameliorating, if not curing, malignant ulcers of the lids, as lupus and epithelioma. In blepharitis Dr. Fowler has used this remedy when the lids are thick, incrustated, dark-red, tender to touch and somewhat ulcerated.

A very interesting case of *suppurative choroiditis* (panophthalmitis) in the right eye of a child, after a needle operation for cataract, occurred in Dr. Liebold's clinic. The lids were enormously swollen, very hard and red, conjunctiva injected, chemosis, anterior chamber filled with pus and cornea tending toward supuration; child pale, weak and restless. Phytolacca was prescribed, externally and internally. Rapid subsidence of all the inflammatory symptoms followed its use.

In *orbital cellulitis* and *panophthalmitis* Rhus tox. should be compared with Phytolacca. The former, however, more often



corresponds to the symptomatology of these diseases, as the symptoms are more intense, pain more severe and inflammation more active under Rhus than under Phytolacca. The lids are also cedematously swollen and lachrymation profuse in Rhus, while they are hard, bluish-red and swollen in Phytolacca.

### PLANTAGO MAJOR.

**Clinical.**—*Ciliary neuralgia from decayed teeth* has been relieved by this drug. "In one case there was a dull, heavy ache in the left eye, with exquisite tenderness of the ball; left upper incisor decayed. Plantago relieved promptly."—J. H. BUFFUM.

### PRUNUS SPINOSA.

*A sharp pain beginning in the right side of the forehead, shooting like lightning through the brain and coming out at the occiput. Pain in the right eyeball as if the inner portion of the eye would be torn out.*

**Clinical.**—As a remedy for ciliary neuralgia, whether originating from some diseased condition of the eye or not, there are few, if any, drugs more often called for than Prunus.

The character of the pains will furnish our chief indications; thus we have pain in the eyeball as if it were crushed or wrenched, or *pain as if pressed asunder*; again we often find the *pain of a sharp, shooting* character extending through the eye back into the brain, or this sharp pain may be seated above the eye extending into and around it or over the corresponding side of the head. Sometimes the pain will commence behind the ears and shoot forward to the eye, but, as already remarked, it is generally of this sharp, piercing character. Motion usually aggravates, and rest relieves, the severity of the pains. The pains are occasionally periodic in character and may be worse at night.

These pains, to which Prunus is adapted, are especially found in disorders of the internal structures of the eye; therefore it has been given in many of these cases with marked benefit. Particularly in sclerotico-choroiditis posterior, have good results been obtained in stopping the progress of the disease.

Other cases of choroiditis, either with or without retinal complication, have been quickly relieved and the vision restored so far as possible in the degenerated condition of the tissues.

The opacities and haziness of the vitreous occurring during the course of choroidal troubles have been known to disappear under Prunus, when given in accordance with the usual indications.

### PSORINUM.

Ophthalmia, with pressing pains, as if sand were in the eyes. Soreness of the eyes and burning; she has to close them constantly. The eyes become gummy. Lachrymation. Lids spasmodically closed. Eyelids swollen and inflamed.

Burning, pressing pains in the eyes. Stitches in the eyes. Itching of the lids, especially in the canthi. Photophobia.

Vision blurred. Fiery sparks before the eyes.

**Clinical.**—This remedy occupies an important position in the treatment of many ophthalmic disorders dependent upon scrofula.

Cases of *ciliary blepharitis*, especially if of a chronic recurrent nature, are often amenable to this drug; they are usually old chronic cases with no marked local symptoms to govern us in the selection of the remedy. Inflammation of the lids, of a more acute character, as when the internal surface has become much congested and combined with great photophobia so that the child cannot open the eyes, but lies constantly on the face, has been cured.

In old recurrent cases of pustular inflammation of the cornea and conjunctiva most benefit seems to have been gained. The chronic nature, recurrent form and scrofulous basis are our chief indications.

A case of serous choroiditis occurring in a young lady about twenty-one was greatly improved under its use. There was some ciliary congestion and great haziness of the vitreous, so that the optic nerve was only discerned with great difficulty, and then was found decidedly hyperæmic, as was the whole fundus. Some headache was present, especially in the morning; also a profuse sweating of the palms of the hands all the time.

### PULSATILLA.

**Objective.**—*The margin of the lower lid is inflamed and swollen, with lachrymation, in the morning. Stye on the lid, with inflammation of the white of the eye, now in one, now in the other canthus, with drawing, tensive pains in the eyes on moving the*

muscles of the face and with ulcerated nostrils. *The eyelids are agglutinated in the morning. Lachrymation in the cold, open air. The eyes are full of water; they lachrymate; blear-eyed. A red (inflamed) spot on the white of the eye, near the cornea.*

**Subjective.**—Dryness of the lids. A biting pain and a sensation of soreness in the inner canthus. Pressive pain in the inner canthus. Violent sticking in the eyelids and canthi in the evening. *Itching (biting) and burning in the lids in the evening.* Dryness of the eye and a sensation in the morning as if a foreign body were pressing in it. Pressure as from sand in the eye when reading. Pressive pain in the eyes as if there were heat in them. A pressive, burning pain in the eyes. *Burning and itching in the eyes, that provokes rubbing and scratching.*

**Vision.**—*Dimness before the eyes and lachrymation in the open air.* Dimness of vision, like a fog before the eyes. Obscuration of vision, with inclination to vomit and paleness of the face. Dizzy obscuration of vision after sitting, on rising and beginning to walk about. Transient obscuration of vision. It seems dark before the eyes in the morning on rising from bed. *During the menses it became black before the eyes and she felt worse on going into a warm room.*

**Clinical.**—This remedy is very frequently indicated in a great variety of diseases of the eye, but in its selection we are governed in a great measure by the temperament and general symptoms of the patient. Those eye troubles, especially the superficial, found in the *negro race, as well as those occurring in the mild, tearful female*, seem to be particularly amenable to Pulsatilla.

Its action upon the lachrymal sac is very decided. No remedy is more frequently needed in the *early stages of acute phlegmonous dacryocystitis* than Pulsatilla. It will sometimes abort the inflammation and prevent the formation of pus, even when the swelling at the inner angle of the eye is extensive, sensitive to touch and involves both lids. It may be useful throughout the whole course of the disease. For blenorrhœal inflammation of the lachrymal sac it is also valuable, especially if the *discharge is profuse, yellow, white, thick and bland* and occurring in a Pulsatilla temperament. It has appeared to be particularly called for in affections of the lachrymal sac found in children.

For *blepharitis*, both acute and chronic, it is a valuable remedy,

especially if there is inflammation of the glands of the lids both meibomian and sebaceous; also in cases of blepharitis in which there is a great tendency to the formation of styes or abscesses on the margin of the lids. It is called for in blepharitis resulting from indulgence in high living or fat food and if accompanied by acne of the face. The swelling and redness of the lids vary in different instances, as does also the discharge, though more frequently we find profuse secretions, which cause agglutination of the lids in the morning. The sensations experienced are usually of an itching, burning character, and are aggravated in the evening, in a warm room, or in a cold draught of air, but *ameliorated in the cool open air*.

If prescribed early in the treatment of *styes* (hordeola) it will, in the majority of cases, cause them to abort without the formation of pus. It is especially adapted to the attack *per se*, but may be of service in preventing the recurrence of successive crops.

In tarsal tumors, especially of recent origin, subject to inflammation or when accompanied by a catarrhal condition of the eye, help has been derived from its use.

Spasmodic action of the lids, with lachrymation and photophobia, has been relieved.

Pulsatilla has been successfully employed in a great variety of conjunctival and corneal affections. It is often the remedy for simple *catarrhal conjunctivitis*, especially the acute form (though also useful in the chronic) either resulting from a cold, from bathing, an attack of measles, or other cause; if there is present a variable amount of redness, even in some cases of chemosis, *burning, itching or sticking pain in the eye; usually worse in the evening, when out in the wind, and after reading, but relieved in the cool open air*. The lachrymation may be profuse by day, with purulent discharge at night, though generally a moderately profuse mucopurulent discharge of a whitish color and bland character, which agglutinates the lids in the morning, is to be found. Catarrhal conditions of the conjunctiva dependent upon gastric disturbances may also require this remedy.

In *purulent ophthalmia* benefit will frequently be derived from this drug if the *discharge is profuse and bland* and the concomitant symptoms also indicate its selection. The form of purulent *ophthalmia found in new-born children* (ophthalmia neonatorum) has been



greatly benefited; even in some instances well-marked cases have been cured without the use of any other drug. It seems, however, especially useful in this trouble as an intercurrent remedy during the treatment by *Argentum nitricum*, for often when the improvement is at a standstill a few doses of *Pulsatilla* will materially hasten the progress of the cure.

It has been employed with some success in trachoma, usually uncomplicated with pannus. The granulations are generally very fine; eye sometimes dry or may be bathed in an excessive secretion of bland mucus. There may also be soreness of the ball to touch and itching or pain in the eye, worse in the evening and better in the cool air or by cold applications. It is especially adapted to cases occurring in anæmic amenorrhœic females.

Another large class of superficial ophthalmic disorders in which *Pulsatilla* is particularly useful is to be found in *scrofulous ophthalmia*, phlyctenular conjunctivitis or keratitis. Here it has proved one of our sheet anchors in the treatment, especially *if the pustules are on the conjunctiva*. The dread of light is usually moderate in degree, though it may be absent. The lachrymation is not acrid, but more abundant in the open air, while the other discharges may be very moderate or profuse, thick, white or yellow and bland. The pains are more often of a pressing, stinging character, though they vary greatly. The lids may be swollen, but are not excoriated, though *subject to stytes*. The eyes feel *worse on getting warm from exercise, or in a warm room* and generally *in the evening*, but are *relieved in the open air* and by cold applications. The concomitant symptoms of ear disorders, thirstlessness, gastric derangement and amenorrhœa must be taken into consideration.

*Pulsatilla* has been successfully given in *ulcers of the cornea*, especially if superficial and resulting from phlyctenules. Excellent results have also followed its use in those *small ulcers* which prove so intractable to treatment, occurring *near the centre of the cornea*, with no vascular supply, especially if found in strumous subjects, with phlyctenules on the cornea or conjunctiva. The photophobia and pain are usually considerable in these cases.

A case of episcleritis, circumscribed, situated between the superior and external recti muscles, was very promptly relieved by this remedy. It occurred in a man highly myopic: the sclera

was slightly bulged and some itching, sticking pain in the ball, with dimness of vision. His eyes always felt much better in the open air.

This drug may occasionally be required in idiopathic iritis, especially in young girls with delayed and scanty menstruation. More often indicated in the colored race.

Its influence upon choroidal affections was illustrated in a case of hyperæmia of the choroid consequent upon hyperopia. The patient could not look long at any object; was subject to severe neuralgic headaches extending into the eyes; head felt full and congested; was a great tea drinker. Puls. effected a cure.—T. F. A.

The value of Pulsatilla in hyperæmia and inflammation of the optic nerve and retina is not, I believe, fully appreciated. Its marvellous results and indications for selection are well illustrated in the following case: A clerk complained of a sensation as of a veil before his eyes, especially in the bright light, together with *headache when in the store, relieved in the open air*. V.  $\frac{1}{3}$ , difficulty. The ophthalmoscope revealed decided injection of the retinal vessels, halo around the macula lutea and hyperæmia of the optic nerve, more marked in the right eye. Within a week, under Puls.<sup>30</sup>, the hyperæmic ring around the macula, dimness of vision and headache were relieved.

In a case of immature hard cataract with blurring of the sight, especially in the forenoon, and some conjunctival irritation, the progress was checked and vision improved under Puls.<sup>200</sup>.—A. WANSTALL.

Accommodative asthenopia, with much aching sensation in the eyes after using; also darting pains in the eyes after sewing, and asthenopia from general prostration, have been cured.—T. F. A.

## RANUNCULUS BULBOSUS.

Sensation of burning soreness in the right lower lid. Smarting and feeling of soreness in the outer canthus of the right eye. Smarting in the eyes. Sore smarting within the right eye. Violent pressing pains in the eyeballs, at times in one, at times in the other. Painfulness of the right eyeball. Mist before the eyes.

**Clinical.**—Ranunculus was found indicated in one case of herpes zoster supra-orbitalis, with bluish-black vesicles, high fever and the usual pains accompanying this disease. The success consequent upon the use of the drug was exceedingly brilliant.

### RHODODENDRON.

Dilatation of the pupils. Periodical burning in the eyes without inflammation. Burning pain in the eyes; when reading or writing he has a feeling of heat in the eyes. Eye symptoms aggravated before a storm.

In insufficiency of the internal recti muscles (asthenopia muscularis) benefit has been derived, as was well marked in a case, in which darting pains like arrows through the eye from the head, always worse before a storm, was an accompanying symptom.—T. F. A.

The prodromal attacks of glaucoma, in which the pains were always worse at the approach of a storm, were entirely relieved by this drug.

Ciliary neuralgia, in which the *pains are always aggravated before a storm*, will usually be relieved by Rhododendron.

### RHUS TOXICODENDRON.

**Objective.**—*Inflammation of the lids.* A red, hard, swelling, like a sty, on the left lower lid, toward the inner canthus, with pressive pain. *Great swelling of the lids.* The eyes are red and agglutinated with matter, in the morning. Relaxation of the eyelids, with puffiness of lids and hot flushed face. *Heaviness and stiffness of the lids, like a paralysis, as if it were difficult to move the lids.* Lachrymation in the evening, with burning pain. Weeping eyes. *Inflammation of the eyes.*

**Subjective.**—Drawing and tearing in the region of the brows and in the malar bones. *Very sore around the right eye.* Violent burning, itching and prickling in the swollen lids. Burning in the inner canthus of the right eye. Itching in the eyes on exerting vision. Aching in the eyes. Her left eye felt enormously swollen and enlarged. Pressive pains in the eyes. Pressure as if dust were in the eye. Sharp pains run from the eyes into the head. Biting as from something sharp and acrid in the right eye. Biting in the eyes; in the morning the eyes are agglutinated with

matter. *When he turns the eye or presses upon it, the eyeball is sore, he can scarcely turn it.*

**Vision.**—Sensation of a veil before the eyes; she could not see well. Extreme confusion of sight. Great obscurity of vision. Objects were seen double.

**Clinical.**—The clinical application of this drug in diseases of the eye is extensive and merits careful consideration. It is of value in many ophthalmic disorders, but it seems especially adapted to the severer forms of the inflammatory process, in which there is a great tendency to suppuration, or even when the formation of pus has already taken place.

For *orbital cellulitis* it is a remedy of the first importance and will no doubt be oftener called for than any other drug, whatever may be the origin of the trouble (whether traumatic or not), as the picture of the disease corresponds very closely to the symptomatology of the drug and experience has proven the truth of the assertion that it is *the* remedy for the treatment of this dangerous malady. Some alarming cases of this disease have been promptly arrested by this drug. In one case, one eye was entirely lost and had been operated upon with a view of providing free exit for the suppurative process and the disease was making alarming and rapid progress in the other eye. *Rhus*<sup>1</sup> speedily arrested its progress.

Epiphora of long standing with no apparent stricture of the lachrymal duct was immediately relieved under *Rhus*<sup>30</sup>.

It will be seen from a study of the symptoms which *Rhus* produces upon the palpebræ that its curative power is chiefly exerted upon those symptoms of the lids which are dependent upon inflammation of the deeper structures. However, we may often find it a valuable remedy in uncomplicated blepharitis, especially of the acute form, if there is a tendency to the formation of an abscess and the *lids are œdematously swollen*, accompanied by *profuse lachrymation* and pains which are worse at night and relieved by warm applications.

We also occasionally find it useful in chronic inflammation of the lids in which there is puffiness of the lids and face, enlargement of the meibomian glands, falling out of the ciliæ, itching and biting in the lids, sensation of dryness of the eyes and burning in the internal canthus, with acrid lachrymation in the morn-



ing and in the open air, or, as is more commonly the case, constant profuse lachrymation which may be acrid or not.

Simple œdema of the lids has been relieved. (Compare Apis, Ars. and Kali carb.)

In erysipelas of the lids of spontaneous or traumatic origin it is a very important aid in the treatment, if there is œdematous erysipelatous swelling of the lids and face, with small watery vesicles scattered over the surface and drawing pains in the cheek and head.

In any of these cases, in which the lids are affected, there is frequently *spasmodic closure with profuse lachrymation upon opening them*, which more than ever points to the employment of Rhus.

Ptosis has been relieved under this remedy; it is probably adapted to that variety caused from exposure to cold or wet (Caust.).

Simple conjunctivitis caused from exposure to wet, or aggravated in damp weather (Calc.) frequently calls for Rhus, especially if there is much *chemosis*, with some photophobia, profuse lachrymation and œdematous swelling of the lids.

In severe cases of conjunctivitis granulosa with pannus the intensity of the symptoms may occasionally be relieved by the use of this remedy and possibly a cure be effected.

Rhus may in rare cases be found serviceable in ophthalmia neonatorum if the lids are red, œdematously swollen and spasmodically closed. There will also be restlessness at night and other concomitant symptoms.

In *ulcers and pustules of the cornea* Rhus has been often employed with success, especially in the latter and superficial forms of ulceration in which the *photophobia is very great*, so that the patient lies constantly on the face. *The lachrymation is very profuse, so that the tears gush out on opening the spasmodically closed lids*, which are usually much swollen, especially the upper. The conjunctiva is quite red; *chemosis*. The skin of the face around the eyes is often covered with a Rhus eruption. The remedy is especially suitable to persons of a rheumatic diathesis. The symptoms are usually worse at night, after midnight and in damp weather, therefore the patients are restless at night and disturbed by bad dreams.

Its action, however, is not confined to the superficial variety of

keratitis, as great benefit has been observed from its use in *suppuration of the cornea, especially if consequent upon cataract extraction.*

In simple idiopathic or rheumatic iritis this drug has proved serviceable, especially in those cases resulting from exposure to wet, or if the predisposing cause can be referred to a rheumatic diathesis.

Mydriasis from exposure to cold and dampness has been relieved by Rhus.

Its grandest sphere of action is to be found in *suppurative iritis*, or in the still more severe cases in which *the inflammatory process has involved the remainder of the uveal tract* (ciliary body and choroid), especially if of traumatic origin, as after cataract extraction. As a remedy in this dangerous form of inflammation of the eye it stands unrivalled, no other drug having, as yet, been found equal to it in importance in this serious malady. The symptoms of the drug will be seen to correspond very closely to a great majority of the cases. *The lids are red, swollen and œdematous, especially the upper, and spasmodically closed, with profuse gushes of hot tears upon opening them; sac-like swelling of the conjunctiva* and yellow, purulent, mucous discharge; *pain in and around the eye*; swelling of the cheek and surrounding parts, besides the usual concomitant symptoms. For suppurative inflammation of a part or whole of the uveal tract of non-traumatic origin, Rhus has been known to restore the eye "ad integrum;" even if the formation of pus has already taken place it may cause its absorption. We also think from experience that it serves, to a certain extent, to prevent suppurative inflammation after severe operations upon the eye, though do not by any means consider it a sure preventive.\*

In paresis or paralysis of any of the muscles of the eyeball resulting from rheumatism, exposure to cold or getting the feet wet this remedy is very useful and should be compared with Causticum in frequency of indication.

The symptomatology of Rhus and Apis are somewhat similar, but the latter is not as frequently indicated in severe inflammations

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\*NOTE.—If most prompt results are not found from the higher potencies in a few hours, the first should be resorted to. This is a most important note to make, for not a moment can be lost in arresting the disease, nor can we afford to produce an aggravation in a sensitive subject with large doses.

of the deep structures which tend toward suppuration as the former. The Apis patient is drowsy and thirstless, while the Rhus patient is restless and thirsty (Arsen.).

*Rhus radicans* has been employed with great success in scrofulous ophthalmia in which the same symptoms are present which have been given under Rhus tox.

### RUTA GRAVEOLENS.

**Subjective.**—Pressure deep in the orbits. Pain as from a bruise in the tarsal cartilages. Stitches in the left frontal bone only while reading. *Pressure over the eyebrows.* Itching in the inner canthi and on the lower lids that after rubbing became a biting, so that the eye filled with water. Burning beneath the left eye. *Sensation of heat and fire in the eyes and aching while reading (in the evening, by the light).* *The eyes feel fatigued, as after reading too long.* Weary pain in the eyes after reading.

**Vision.**—*Vision very weak, as if the eyes were excessively strained.* Objects seem dim before the eyes, as if a shadow were flitting before it.

**Clinical.**—Ruta has been of service in a case of choroiditis in a myope resulting from over-straining the eyes. There was much pain in the eyes on trying to look at objects, heat in the eye (though it seems cold) and twitching in the eyeballs.—T. F. A.

Under the use of this drug the vision has been restored in amblyopia dependent upon over-exertion of the eyes in anomalies of refraction, or even when no cause has been apparent.

Its chief value is to be found in the relief of *asthenopia*, in which it is a remedy of the first importance. It is more often indicated in *weakness of the ciliary muscle* than of the internal recti. Such asthenopic symptoms as heat and *aching* in and *over the eyes*, feeling as if the eyes were balls of fire at night, blurring of the vision, letters seem to run together and lachrymation, which are caused or always made worse by straining the eyes at fine work or too much reading, are often relieved by a few doses of Ruta.

We must, of course, remember that a great majority of these cases are dependent upon anomalies in the refraction or accommodation which render the proper selection of glasses absolutely necessary before we can ameliorate the asthenopic symptoms.

In comparing the usual remedies employed in asthenopia it will

be found that Conium and Arg. nitr. are very similar in their action to Ruta; all three are especially called for in accommodative asthenopia. Conium has more photophobia and Arg. nitr. more tendency to catarrhal symptoms than Ruta. The asthenopic symptoms which Nat. mur. relieves are more commonly dependent upon muscular asthenopia.

### SANGUINARIA.

Redness of the eyes in the morning. Lachrymation. Burning dryness in the eyes. Pain over the eyes. Dilatation of the pupils. Headaches in a small spot over the right eye. Eyes relieved by hard pressure upon the eyeballs.

**Clinical.**—Benefit has been derived from its employment in blepharo-adenitis, with a feeling of dryness under the upper lid and burning in the edges of the lids, with accumulation of mucus in the eye in the morning.

Acute conjunctivitis, with excessive redness and numerous ecchymoses in the conjunctiva, tending towards trachoma, with moderate discharge and some pain in the eye, has been speedily cured by the local use of Sanguinaria (gtt. x : aq c. 3j).

### SECALE CORNUTUM.

Cataracts, both hard and soft. Eyes sunken and surrounded with a blue margin. Dilatation of the pupils. Dimness of vision.

**Clinical.**—The unquestionable production of cataract by this drug should suggest its use in checking the progress of this disease.

From a study of the general action of Secale, it is recommended for retinitis diabetica.

### SENEGA.

Weakness of the eyes, with much smarting, burning and lachrymation. When looking at an object intently or permanently the eyes tremble and run. Aching pain over the orbits. Dull, aching, pressive pains about the eyes. Drawing and pressure in the eyeballs, with diminution of visual power.

**Vision.**—Weakness of sight and flickering before the eyes when reading, obliging one to wipe them often. Objects look shaded. While reading the eyes feel dazzled; this makes reading difficult.



Flickering before the eyes and weakness of sight when continuing to read or write. When walking toward the setting sun he seemed to see another smaller sun hover below the other, assuming a somewhat oval shape when looking down, *disappearing on bending the head backward and on closing the eyes*. Flickering and running together of letters when reading.

**Clinical.**—The action of Senega upon the lids is very marked in the provings. This, together with its marked action upon general mucous surfaces, renders its use in catarrhal ophthalmia obvious, as also in blepharitis, in which there is smarting and dry crusts on the lids, especially in the morning.

Very marked improvement was observed from this drug in an old case of opacities in the vitreous. Within three months the vitreous had cleared to such an extent that the vision had increased, from counting fingers at ten feet, to  $\frac{10}{70}$  and was still improving under Senega<sup>3</sup>.—A. WANSTALL.

Senega is of great importance in promoting the *absorption of lens fragments* after cataract operations or injuries to the lens.

In addition to and corresponding with the general muscular laxity we find remarkable symptoms of paralysis of the muscles of the eye.

This remedy is of the first importance in weakness or even paralysis of the recti and oblique muscles, especially in hyperphoria. The patient will usually complain of dull, tired, aching or pressive pains in, around or behind the eyes, with smarting and burning in the eyes, always worse after any use. There may be conjunctival catarrh and often general headache or dullness in the open air.—G. S. N.

## SEPIA.

**Objective.**—*Lachrymation, morning and evening*. Lachrymation in the open air. Drooping of the eyelids, with the dull headache. Agglutination of the eyelids. A red, herpetic spot on the upper eyelid, scaly and peeling off. *Pustules on the conjunctiva of the left eye*. A swelling in the eyes, burning and a flow of tears, which affords relief. Inflammation of the eyes, with redness of the whites; stitching and pressure therein. Redness of the white of the eye in the morning on awaking, with burning, smarting and pressure. The eyes feel tired and look injected.

**Subjective.**—Eyelids heavy, with much frontal pain. Heat and dryness of the margins of the lids. The eyelids pain on awaking as if too heavy. Great itching of the margin of the lids. Momentary attacks of giddiness while writing. In the evening, after walking in the cold wind, I had a sore, rough, burning feeling in my eyes, aggravated by gas-light and on attempting to read. Eyes feel very sore, as if bruised. Dragging feeling in eyes. Pressure in the right eye, as from a grain of sand, aggravated by rubbing; felt most sensitive when pressing the eyelids together. Pressure in the eyes at night. Great burning and lachrymation of the eyes. Burning in the morning. Eyes hot and dry. Eyes feel like balls of fire, especially the left, which is much injected. A slight burning feeling in the eyes and a desire to close them; they feel sore to touch. Smarting pain in both eyes. *Smarting in the right eye, in the evening*, with inclination of the lids to close against one's wish. The eyes become fatigued from reading and writing. The candle-light fatigues the eyes when reading or writing by causing a contractive sensation. Cannot bear reflected light from bright objects; annoyed by reflections from bright objects.

**Vision.**—Vanishing of sight. Vision is impeded by fiery zigzags before the eyes. Fiery sparks before the eyes, with great weakness. Flickering before the eyes when looking into light; he sees a zigzag circle of colors. Many black spots before the eyes. During the menses everything gets black and clouded before the eyes, in the evening, accompanied by great weakness, which passes off when lying.

**Clinical.**—Sepia is especially adapted to ophthalmic disorders dependent upon uterine troubles, and in prescribing this drug great reliance should be placed upon these and other accessory symptoms.

The *aggravation morning and evening*, and the amelioration in the middle of the day are almost always present.

In chronic ciliary blepharitis very favorable results have been obtained from Sepia. In addition to the scaly condition of the lid margin, *small pustules will usually be found on the ciliary border* (Ant. crud.). The subjective symptoms will also indicate our choice, as feeling of heaviness in the lids in the morning, or on waking at night; soreness or numb pain in the internal canthi

and scratching sensation in the eyes, worse at night and at any time during the day, upon closing the lids, as they feel as if they were too tight and did not cover the eye. The aggravation of the symptoms morning and evening will usually be noticed.

Tarsal tumors have been benefited by Sepia<sup>30</sup>.

Acute catarrhal conjunctivitis, with *drawing sensation* in the external canthus and smarting in the eyes, ameliorated by bathing in cold water and *aggravated morning and evening*; also conjunctivitis, with muco-purulent discharge in the morning and great dryness in the evening, have been quickly relieved under this remedy.

In follicular conjunctivitis, or a mixed form of follicular and trachomatous conjunctivitis, and in conjunctivitis vernalis, which is only observed *during the summer*, or always made worse by hot weather, Sepia is especially indicated. It may be serviceable in trachoma, with or without pannus, especially in tea-drinking females. It is indicated if there is excessive irritability of the eye to both use and light, particularly night and morning, better through the day; lids close in spite of him and sparks may be flashing before the eyes.

It is sometimes indicated in phlyctenular conjunctivitis, though not as frequently as when the cornea is implicated.

For keratitis phlyctenularis, especially in females suffering from uterine disturbances, Sepia is of great value. The pains are usually of a drawing, aching or sticking character, aggravated by rubbing, pressing the lids together, or pressing upon the eye. The light of day dazzles and causes the head to ache, with lachrymation, especially in the open air. The conjunctiva may be swollen, with considerable purulent discharge, edges of lids raw and sore and eruption on the face. The usual time of aggravation is present.

Dr. C. Th. Liebold has used it with very favorable results in keratitis parenchymatosa complicated with uterine troubles.

At Dr. W. H. Woodyatt's suggestion, Sepia has been employed in several cases of cataract, especially in women, with manifest advantage, arresting the progress of the disease and often improving the vision very decidedly. The concomitant symptoms will guide us in the selection of this remedy in diseases of the lens.

## SILICEA.

**Objective.**—*Swelling in the region of the right lachrymal gland and lachrymal sac.* Lachrymation. Agglutination of the eyes. Twitching of the eyelids. Redness at first around the eyes, then also of the white of the eyes, with inflammation and lachrymation. Redness of the whites of the eyes. *Ulcer on the left eye.*

**Subjective.**—Pressure in the upper lid, with violent stitches, as from a splinter, and vanishing of visual power. The eyes are painful, as if too dry and full of sand, in the morning. Tension in the eyes and forehead, with weakness of the body. Piercing, stinging pain in the left eye. Tearing and burning in the eyes on pressing them together. Heat and smarting in the eyes.

**Vision.**—Vision indistinct, misty, with flickering before the eyes. She could neither read nor write; everything ran together.

**Clinical.**—Silicea is more commonly indicated in caries of the orbit than any other remedy in the materia medica.

In diseases of the lachrymal apparatus it is a remedy of prime importance. It is often indicated in inflammation of the lachrymal sac (dacryocystitis) characterized by all the prominent symptoms, swelling, tenderness, pain and lachrymation, especially if the patient takes cold easily or is very sensitive to a draught of air. Several cases, even though so far advanced that suppuration seemed inevitable, have been cured without breaking externally and without the aid of an operation. But, notwithstanding, experience shows how much may be sometimes gained from the administration of Silicea and other remedies, yet we would not advise delay in opening the canaliculus as soon as pus has begun to form.

Blenorrhœa of the lachrymal sac has quite frequently been controlled, and Sil. should be one of the first remedies thought of in connection with this trouble.

The treatment of acute lachrymal fistulæ by Sil. has been attended with favorable results, but chronic cases do not seem to yield to this or any other drug.

Blepharitis, either acute or chronic, caused or aggravated from working in a damp place or from being in the cold air will often require Silicea (compare Calc.).

It has been useful in tarsal tumors when indicated by concomitant symptoms.



Silicea is often the remedy for sloughing ulcers of the cornea, with or without hypopyon; for *crescentic ulcers*; for small round ulcers which have a tendency to perforate, and also for non-vascular ulcers centrally located. The pains, photophobia and lachrymation are not particularly marked. The discharge is frequently very profuse, though it may be moderate in quantity. But there is almost always present in these cases, in fact in the majority of ophthalmic disorders which call for Silicea, a *great sensitiveness to cold and desire to be warmly wrapped, especially about the head*.

For hypopyon it is especially valuable.

It has also proved useful in choroiditis in a myope in whom, upon any exertion of the eye, excessive pain extended to the head and ears.—T. F. A.

Irido-choroiditis, with great tenderness of the eye to touch, deep ciliary injection, contraction of the pupil, posterior synechiæ and excessive sensitiveness to a draught of air will be found amenable to Silicea.

Many brilliant cures of cataract under this remedy are reported, though grave doubts are entertained regarding the correctness of the diagnosis. It may be serviceable, however, in checking the progress of cataract when indicated by concomitant symptoms, upon which chief reliance is placed in prescribing for diseases of the lens.

Ciliary neuralgia, characterized by *darting pains through the eyes and head upon exposure to any draught of air*, or just before a storm, has been speedily relieved by Silicea.

Silicea and Hepar should be compared with each other, as their actions are very similiar. Both are indicated in ulceration, are relieved by warmth and aggravated by cold. The ulceration of Hepar is, however, usually accompanied by more pain, redness, photophobia and sensitiveness to touch than that of Silicea.

### SPIGELIA.

**Objective.**—Lids lax and paralyzed; they hang low down and must be raised with the hand, with dilated pupils. Redness and inflammation of the white of the eye; in the morning the lids are so heavy that he can scarcely open them. Lachrymation.

**Subjective.**—Pain as if the upper lid were hard or immovable; he cannot raise it easily. Fine painful cutting on the margin of the left lower lid like a knife. Striking pressure under both lids. Pain as if the left orbit were pressed from above downward. *Tensive, tearing pain in the forehead, especially beneath the left frontal eminence, extending toward the orbits. Thrust-like tearing pain in the forehead, worse in the right frontal eminence. A shoot of pain through the forehead. Burning pain in the right side of the forehead, extending to the eye, so that he could not turn it without pain. The eyes hurt on motion, as if too large for their orbits. He could not turn the eyes in all directions without pain. Violent burrowing stitch in the middle of the eye and inner canthus that does not prevent vision, but presses the upper lid downward. Intolerable pressive pain in the eyeballs, still more painful on turning the eyes; on attempting to look with the eyes turned he became dizzy, so that he was obliged to turn the whole head. Pressive pain in the eyeballs. A contractive burning pain in the right eyeball. Constant sticking pain in the right eyeball also on moving it. Itching stitch in the right eyeball that returned after rubbing.*

**Clinical.**—Spigelia is especially applicable to severe neuralgic pains arising in a great variety of ophthalmic trouble, particularly in rheumatic and arthritic inflammations. In all cases the character and intensity of the pains furnish the chief indications for the selection of this remedy.

Ptosis, as one would be led to suppose from the symptomatology; should often require the use of Spigelia. A case, occurring in a seamstress, after inflammation, with sharp stabbing pains through the eyes and head and much hot, scalding lachrymation, was very favorably affected by its use.—T. F. A.

It is not a remedy which we would be liable to think of in inflammatory diseases of the conjunctiva or cornea, still it has been found beneficial in exceptional cases when accompanied by the characteristic sharp pains. Even in ulcers of the cornea, with considerable infiltration into the cornea around the ulcer, its employment has been followed by brilliant results, providing *shooting, radiating pains from the eyes into the head*, usually worse at night, have been present.

Excellent results have been obtained from this drug in iritis, especially in the rheumatic form, with severe pains around and deep in the eye.

The pains of glaucoma may indicate this remedy. Benefit has also been derived from its use in sclero-choroiditis accompanied by much pain.

In accommodative asthenopia, with slight retinitis and severe neuralgic headaches; also in asthenopia, with anæmia of the optic nerve and characteristic pains dependent upon too great indulgence in tea, great benefit has been obtained from Spigelia.

It is, however, in ciliary neuralgia, intermittent or not intermittent, dependent upon some observable disease or arising from some cause unknown, that the greatest power of Spig. is exercised. The pains are various in character, though usually *sharp and stabbing, like a knife sticking through the ball into the head, or they may seem to start from one point and then radiate in different directions; are generally aggravated by motion and at night.* The following variety of pains, as described by patients, have been cured by Spigelia, in addition to those already given: Pains around and deep in the eye. Severe pain on moving the eyes, worse at night. Severe pressure extending to the orbit after sleep, or as if the eye would ulcerate. Very severe, sharp pain in and around the left eye, seems as if it would drive him crazy, wakes him at 3 A. M. and continues the remainder of the night; also has a similar attack in the latter part of the forenoon, always accompanied by fever and sweat. Sharp pains through the right eye and corresponding side of head, worse at night and relieved by warmth, accompanied by excessive sensitiveness of the eyeball to touch. Burning or sticking pains in the eye and sensation as if the eyeball were too large. Burning pains going to the bones. Sticking, boring pains extending to the bones around the eyes, especially supra-orbital and temporal regions. Eyes feel too large and as if forcibly turned around in the orbit; the pain makes one shut the eye and, on opening it, seem to see a sea of fire; with severe pain, hot tears run out of the eye and the pains are worse in the open air and at night. After long continued use of the eyes, terrible pains every morning at six in the left eye, as if the ball were too large and was forcibly pressed out of the orbit, with violent aching, boring and severe stitches, made worse by opening and moving the eye, often extending to the forehead. The slightest touch excites the pains, which disappear about noon. Severe, boring pain deep in the eye, aggravated on moving it; parts around the eye painful to

touch and sparks before the vision. Sharp sticking pains through the ball of the eye into the head on the right side, worse at night; frontal headache and frequent winking. Intolerable pain in the supra-ciliary ridge, worse on any change of weather and in the wind. Severe, pressing, jerking, sticking pains in the left eye, so hard as to cause her to cry out and lose consciousness; every few minutes they would extend to the muscles of the left upper arm.

### SPONGIA.

**Clinical.**—The chief use which has been made of Spongia in ophthalmic therapeutics has been in Basedow's disease, as the following case will illustrate: A woman, about 40. Eyeballs staring and perceptibly protuding; stitches in the balls and burning around the eyes, with lachrymation worse from any sudden light; often the eye feels as if twisted around; there is constant flashing of different colors, mostly deep red, figures of light, etc., even when the eye is closed, especially at night. The thyroid gland is considerably hypertrophied. The palpitation of the heart is very marked, which makes her uneasy, restless and easily frightened, especially at night. Spongia in the higher potencies effected a cure.—T. F. A.

### STANNUM.

*Pustular swelling of the left inner canthus.*

Pressure in the left inner canthus as from a sty, with lachrymation. Itching in the inner canthus. Vertigo when reading, with loss of sight.

**Clinical.**—Ptosis from sympathetic paralysis, in which the disease returned every Tuesday, was cured by Stannum.—J. A. CAMPBELL.

Stannum, first employed by Drs. Liebold and Hunt in blenorrhœa of the lachrymal sac, has now become one of our most common remedies for this affection. It is often used with advantage in controlling the profuse yellowish-white discharge observed in this condition. There may be a tendency to a more active form of inflammation, especially toward night, and accompanied by sharp pain in the internal canthus.



### STAPHYSAGRIA.

**Subjective.**—Pain as if a hard substance were lying beneath the left upper lid. Pressure in the upper lid all day, worse on closing the eye. *Itching of the margins of the lids.* Dryness of the eyes. The eyes are dry in the morning on waking. The eyes are dry in the evening, with pressure in them.

**Clinical.**—The clinical application of Staphysagria has been chiefly confined to the lids. The form of blepharitis to which it is adapted is characterized by dryness of the margins of the lids, small, hard nodules on the ciliary border and destruction of the hair follicles, with much itching of the margins of the lids.

Its greatest usefulness is in tarsal tumors, in which it is quite commonly employed, as when the glands of the lids are enlarged, with redness and tensive tearing pains, especially in the evening, or more particularly if *little, hard nodules are found on the lids, resulting from stytes*, also if crops of small, tarsal tumors are constantly recurring.

Syphilitic iritis, with bursting pain in the eyeball, temple and side of face, worse from evening to morning and upon using the eyes by any light, was promptly relieved by this drug.—C. A. BACON.

### SULPHUR.

**Objective.**—Lachrymation in the morning, followed by dryness. Lachrymation and burning in the morning. Swelling and pain in the eyelids, with lachrymation. Redness of the eyelids and conjunctiva. Eruption of pimples on the upper lid. *Agglutinated eyes, in the morning.* Jerking in the lids. Eyes sunken, surrounded by blue rings. *Redness of the eyes during the day; violent itching in them in the evening.* A white vesicle on the white of the eye, close to the cornea. Purulent mucus in the eyes. Heaviness of the eyes. Dryness of the eyes.

**Subjective.**—*Much itching in the eyebrows* and in the tip of the nose. *Dryness of the inner surface of the lids.* Pressure in the eyelids in the evening. *Burning of the lids*, which are inflamed and red and tense on motion. Sticking and burning in the outer canthi. Burning in the edges of the lids in the morning; cutting, burning pains in the borders of the eyelids and especially in the

external canthi. *Smarting pain as from dryness of the margins of the lids.* Smarting of the lids; inclination to rub them; the eyes can hardly bear the light in the evening. In the morning, slight sensitiveness of the edges of the lids. In the morning, on awaking, feeling of sand in the eyes, with raw pain on rubbing them. *In the morning, after awaking, painful, rubbing, dry feeling* in the borders of the right eyelids. *Itching of the eyelids, as if they would become inflamed.* The eyes can scarcely endure the light at all in the evening. *Itching and burning of the lids, which are red and swollen in the morning.* A sensation of pricking in both eyelids, causing him to scratch and rub them. In the afternoon, itching, burning and redness of the edges of the lids. Itching on the borders of the eyelids.

The eyeballs are painful on moving them. Pressure in the eyeballs on walking in the open air. In the evening, dull aching and feeling of weight in both eyeballs, with loss of vision, as if a thick veil were before the eyes. Pain as from dryness of the eyeballs and a sensation as if they rubbed against the lids.

*Burning in the eyes, especially toward the external canthi, at various times of day.* Burning and easy fatigue of eyes when reading. Burning of the eyes, without redness. *Burning of the eyes, with great sensitiveness to daylight.* *Burning in the eyes with redness of them.* *In the afternoon, burning, shooting beneath the lids of the left eye, as though sand had got into it.* Painful smarting of the eyes. Sensation of foreign body in the eyes. *Violent pains in the left eye, as if it were rubbed against spiculæ of glass and drawn in toward the pupil; he was obliged to close the eye five or six times involuntarily; this was followed by burning in the eye and flow of tears.* *Severe cutting in right eye.* Shooting in the left eye, preventing him from reading for several days; when he attempts to read he gets, immediately, violent *shooting pains* through the middle of the pupil deep into the eye. Biting of the eyes and lachrimation every evening. *Stitches as with a knife in the right eye.*

**Vision.**—Dimness of vision as from a fog, with the headache. Dimness of vision of both eyes, with great sensitiveness to bright daylight. Dimness of vision and weakness of both eyes, with innumerable confused, dark spots floating before the eyes. Very often a feeling of heaviness and aching in the eyeballs when read-

ing or writing. I must cover the eyes with the hand, slightly press and rub them in order to read. *Sensation of a veil before the eyes and dim vision for near and distant objects. Sensitiveness of the eyes to daylight. Intolerance of sunlight.* Obscuration of vision while reading. Objects seem more distant than they really are. *Flickering before the eyes. Dark points and spots before the eyes.* Black flies seem to float not far from the eyes,

**Clinical.**—The clinical application of Sulphur in diseases of the eye has been more varied than that of any other remedy, though it will be seen that its sphere of action is usually well marked.

In blenorrhœa of the lachrymal sac it may be of service, though it is not often indicated.

*Blepharitis*, particularly the chronic form, quite frequently calls for this drug, especially if occurring in children of a strumous diathesis who are irritable and cross by day and *restless and feverish by night*. The lids are swollen, red and agglutinated in the morning, or there may be numerous small, itching pustules on the margins of the lids. There may be itching, biting, burning or sensation as if sand were in the eye, though the pains are usually of a sticking character. There is generally great aversion to water, so cannot bear to have the eyes washed. It is especially useful if the blepharitis appears after the suppression of an eruption or if the child or adult is already covered with eczema.

Eczematous affections of the lids have been often controlled when Sulph. has been given according to the indications for eczema in other portions of the body.

In *conjunctivitis catarrhalis*, both acute and chronic, this remedy is often very useful. The degree of redness may vary greatly, be confined to one eye, or involve both. The lids may be swollen, even puffy, or remain unaffected. But the *sharp, darting pains, like pins sticking into the eye*, will furnish our chief indications (these pains are characteristic of the drug and may occur at any time of the day or night). There may also be pressing, tensive, cutting or burning pains, feeling as of sand in the eyes, tearing in the head; poor appetite and feverishness at night, with chills during the day.

Acute and chronic trachoma has been benefited by Sulphur. It is often called for as an intercurrent remedy, even if it does not

complete the cure alone, especially if the pains are *sharp and sticking* in the morning and the lids are glued together so that it is with the greatest difficulty they can be opened. Water is not a favorite application and usually aggravates the trouble.

Sulphur has been employed with success in ophthalmia neonatorum, especially in chronic cases which have a great tendency to relapse.

It is, however, the remedy "par excellence" for *pustular inflammation of the cornea or conjunctiva*. As its sphere of action is very wide, it is adapted to a great variety of cases, especially if chronic and occurring in scrofulous children covered with eruptions (among which the majority of these cases are found). The character of the pains may vary, though they are usually *sharp and sticking, as if a needle or splinter were sticking into the eye, or there may be a sharp, shooting pain going through the eye back into the head, from one to three A. M.*, awakening him from sleep; although besides these we have a variety of other sensations, such as smarting, itching and burning in the eyes, a feeling of pressure as from a foreign body, stinging, burning in the eye, especially from light and in the morning, painful dryness as if the lids rubbed the eyeballs, bruised pain, etc. The photophobia is generally very marked and the lachrymation profuse, though in some cases they may be almost or entirely absent. The redness varies greatly, but is usually considerable, especially at the angles. The secretions also vary both in quantity and quality, being often, however, acrid, corrosive and sometimes tenacious. Agglutination in the morning is commonly present. The lids are often swollen, burn and smart as if bathed in some acrid fluid, or there is an itching sensation, compelling the patient to rub them most of the time. The lids, as well as the surrounding integument of the head and face, are frequently covered with an eruption. All the symptoms are, as a rule, made *worse by bathing the eyes*, so that the child cannot bear to have any water touch them. Open air, especially on first going out, usually aggravates.

The value of Sulphur in the treatment of *ulcers and abscesses of the cornea* is hardly less than in pustular inflammation. Its usefulness is not confined to any one species of ulcer, as it has cured not only the *superficial variety*, but also the deep, sloughing form which tends toward perforation and destruction of the whole cor-



nea. In fact it should always be thought of in ulceration or abscess of the cornea with hypopyon, especially if of an indolent type with no photophobia or vascularity, as it has often produced absorption of the pus and exercised a beneficial influence over the destructive process going on in the cornea. The indications which lead us to its selection are derived chiefly from the general condition of the patient, while the eye symptoms are the same as those given above for the phlyctenular form of inflammation, except that in severe cases the pains may be more intense. There may be severe, pressing pains in the eye, besides the characteristic stitches. The other symptoms may also be proportionately increased.

*Pannus*, resulting from various causes and occurring in patients of a strumous diathesis, has been frequently cured under this remedy. In some instances there has been true pannus crassum, the whole of the cornea presenting the appearance of a piece of fresh, raw beef, and yet vision has been restored by the internal administration of Sulphur. It is especially useful in the so-called herpetic pannus resulting from phlyctenular inflammation.

A case of keratitis parenchymatosa in a scrofulous subject, cornea like ground glass, photophobia, lids swollen and bleeding easily, was permanently relieved by this remedy. It will often be found to promote absorption of the infiltration after the disease has been checked by other remedies.

In severe forms of inflammation of the cornea the iris not unfrequently becomes involved (kerato-iritis), though this does not by any means contra-indicate the use of Sulph., even if hypopyon be present.

It has been employed with favorable results in inflammation of the sclera, with corneal and iritic complications, as well as in uncomplicated cases. There may be, in addition to the well known objective symptoms, only a feeling of fullness and largeness of the eyeball, worse from use or exposure to light, especially gaslight, or there may be great photophobia, acrid lachrymation and severe, tearing pains in the supra-orbital and temporal regions, as well as in the eye itself, especially worse in the evening and at night (Merc.).

In iritis, both idiopathic and syphilitic (especially the former), benefit has occasionally been derived from the use of this remedy,

though it is not frequently indicated. It is especially adapted to chronic cases marked somewhat by drawing pains around the eye, but chiefly by *sharp, sticking pains* in the eyes, worse at night (Spig.) and toward morning. The eyeballs may be painful on motion and the usual characteristic symptoms are present.

The hypopyon resulting from iritis or, in fact, pus found in the anterior chamber under any circumstances, will frequently disappear after the administration of a few doses of Sulphur. (Compare Hepar and Sil.)

Benefit has been derived from the use of Sulphur in inflammatory affections of the fundus. It has been successfully employed in chorio-retinitis and uncomplicated choroiditis, if accompanied by *darting pains*, and in one case in which hemeralopia was present. It is not, however, a frequently indicated remedy in any of the acute forms of intra-ocular disease, though is sometimes useful, especially as an intercurrent; it is particularly called for in chronic cases.

Retinitis caused from over-study, with much congestion of the optic nerve, outlines ill-defined and accompanied by pain around the eye and itching in the internal canthi, has been cured.—T. F. A.

Sulphur often acts very promptly in clearing up opacities in the vitreous, resulting from choroidal exudations and old hæmorrhages.

Asthenopia, both muscular and accommodative, has been occasionally benefited by Sulphur when the character of the pains has pointed to its selection. "Gaslight hurts more than sunlight," a symptom not rarely found in these cases, has been relieved.

Benefit was derived from this remedy in the following case of paresis of the external rectus muscle: A woman, æt. 40, had, for three months, been troubled with double images to the right and downward. There was no perceptible diminution in the movements of the eye and no cause for the paresis was apparent. There was some pain in the eye on looking upward; some headache and restlessness at night. Various remedies were used for two months with no avail. Under Sulph.<sup>30</sup> a cure resulted in three weeks.

The *iodide of sulphur* has occasionally been employed in ophthalmic diseases with marked success, especially in strumous subjects with enlarged glands.

### SYPHILINUM.

**Clinical.**—Very marked success has attended the use of this remedy in some cases of chronic recurrent phlyctenular inflammation of the cornea. When indicated, successive crops of phlyctenules and abrasions of the epithelial layer of the cornea will be found; the photophobia will be intense and the lachrymation profuse; the redness and pain will vary, but will be usually well marked. It is indicated in delicate, scrofulous children, especially if any trace of hereditary syphilis can be discovered.

### TABACUM.

Pains behind the eyeball.

**Clinical.**—The following case, consequent upon the use of tobacco, may prove interesting: The patient was amblyopic, vision  $\frac{20}{100}$ , refraction normal, divergence of one and a half lines behind a screen, diplopia in the distance. On leaving off tobacco for a time he improved and saw single, but within ten minutes after returning to its use the vision became dim, black spots floated before the eyes and he saw double. Stimulants only aggravated the difficulty.

(See cure of tobacco amaurosis under *Nux v.*)

### TELLURIUM.

**Clinical.**—Tellurium has proved successful in conjunctivitis pustulosa, with eczema impetiginoides on the lids and much purulent discharge from the eyes; also an offensive discharge from the ear, to which the child was subject.

It is probably more often indicated in scrofulous ophthalmia than we are now led to suppose.

The offensive otorrhœa, smelling like fish-brine, is an important concomitant symptom.

### TEREBINTHINA.

**Clinical.**—In a comparatively rare form of ciliary neuralgia, with acute conjunctivitis, Terebinth is the remedy most frequently indicated. The injection of the conjunctiva is variable, sometimes being excessive and again very moderate, amounting to hardly more than a simple hyperæmia, but at no time commensurate with

the severity of the pain. The redness is usually dark, especially in the later stages, though during the height of the inflammation may be bright. There may be chemosis and even infiltration into the cellular tissue of the orbit. Deep ciliary injection, swelling of the lids, photophobia and lachrymation may be present. The pupil is contracted, but dilates regularly, though slowly, under Atropine. The tension is changeable even within a short time, though is more frequently diminished than otherwise. The eyeball is sensitive to touch. *The pain is excessive* and always present; varies in character from a dull, "grumbling," aching, beating, sore pain to a severe, sharp, darting pain seeming as if it would almost drive the patient crazy; not only involves the eyeball, but is especially severe *over* and around the eye, extending through to occiput on corresponding side of the head, often following the course of the supra-orbital nerve; is always *worse at night*, and is frequently accompanied by severe paroxysms, particularly in the early morning hours (1 to 3 A. M.). The corresponding side of the face is flushed. General disturbances will accompany the above, especially *scanty and high-colored urine, with pain in the back*, which is always present when Terebinth is indicated. (Compare Amyl nitrite.)

A man, about 40 years of age, had been suffering from episcleritis in the left eye for over three weeks. The eye was very red, especially at inner side of the cornea, where there was a hard, bluish-red elevation. *The pain in the eye and corresponding side of the head was intense day and night.* The pupil reacted well. The urine was very dark. Atropine and various remedies of both schools had failed to relieve. Terebinth<sup>1</sup> relieved the pain in a few hours and a complete cure resulted in less than a week.

This remedy, first employed in iritis by Dr. Liebold, has proved a valuable remedy, especially in rheumatic iritis. *The pains will be intense* and the characteristic urinary symptoms—frequent desire, pressure and pain in the kidneys, burning in the urethra and dark urine—will be present. Also called for if there is a suppression of habitual perspiration of the feet.

### THUJA.

**Objective.**—Agglutination of the lids at night. Pimple on the margin of lower lid. Styne on the right eye. The white of



the eye is very much inflamed and red. Weak eyes, pressure as from fine sand in them.

**Subjective.**—Tearing pain in the left eyebrow, disappearing after touch. Feeling as if the eyelids were swollen and a foreign body were in the eye. Burning and stinging in the edges of the eyelids in the evening. Feeling of dryness in the eyes. Feeling of sand in the eyes. Burning and stinging in both eyes and eyelids, with injection of the cornea. Pressure in the eyes. A painful stitch through the centre of the left eye, commencing in the centre of the brain.

**Vision.**—Dimness of vision like a mist before the eyes and pressure in them as if they would be pressed out of the head or as if they were swollen. Dimness of vision in the open air, like a veil, for near and distant objects, with confusion of the head for half an hour. The vision seems dim, with a feeling as if something were before the eyes. *Muscae volitantes*. Great flickering before the eyes. Seeing of a luminous disc shining like a firefly.

**Clinical.**—No remedy is more frequently indicated in *tarsal tumors* than Thuja, especially for verucæ and tumors that resemble small condylomata, though it is also useful in other varieties, not only in preventing their return after removal by the knife, but in promoting their absorption without the employment of instrumental means. This can sometimes be done by simply using the drug internally, though it usually seems to act more rapidly if employed in the tincture externally at the same time.

“In two cases of what appeared undoubted epithelioma of the left lower eyelid, one of eight months’ the other three years’ standing, there was complete recovery under Thuja locally and internally.”—C. M. THOMAS.

Conjunctivitis trachomatosa, in which the granulations are large, like warts or blisters, with burning in the lids and eyes, worse at night, photophobia by day and suffusion of the eye with tears, would lead us to give Thuja.

In chronic cases of large phlyctenules of the conjunctiva, which are very slow in progress, unyielding to treatment and which decidedly involve the sub-conjunctival tissue, Thuja will often be found to be the remedy.

It has occasionally been of service in inflammations of the cor-

nea, especially in ulcerations of a syphilitic origin, even if hypopyon is present.

The action of Thuja upon the sclera is very marked indeed; probably more so than any other drug. It has been employed with excellent success in *episcleritis*, *scleritis*, sclero-choroiditis ant. and commencing scleral staphyloma, even when no characteristic indications were present. There will, however, usually be sensitiveness of the eyeball to touch and aching pain in and over the eye, with some heat.

For syphilitic iritis, with *gummata on the iris*, it is a grand remedy. The pains are usually severe, sharp and sticking in the eye, worse at night, with *much heat* above and around the eye, or there may be a pain in the left frontal eminence as if a nail were being driven in; in some cases the pain is described as a dull aching in the eye and sometimes seems relieved in the open air.

The following symptom of vision was relieved by Thuja: "Flames of light before the eyes, mostly yellow."—T. F. A.

#### VERATRUM VIRIDE.

**Subjective.**—Aching in the upper part of the right orbit. Full, pressing, heavy feeling in the eyes, with slight headache. Severe shooting, suddenly-stopping pain in left eye. Pupils dilated.

**Vision.**—Dimness of sight. Cannot walk; if I attempt it I am very faint and completely blind. Photophobia and vertigo, relieved by closing eyes and resting head. If I assumed the erect position for even a minute, dimness of sight and partial syncope supervened. Unsteady vision.

**Clinical.**—In erysipelatous inflammation of the lids, face and head, especially if of traumatic origin, Veratrum viride, as recommended by Dr. Liebold, has proved of great value. It is usually used locally as well as internally.

From the experience of Dr. D. J. McGuire it seems that Veratrum viride must be an important remedy in a certain class of ocular diseases dependent upon menstrual irregularities.

The doctor also says: "My experience with the remedy has been quite extended, and while I have found its principal sphere of usefulness in diseases of the fundus oculi to be confined to females, it has not been entirely so. In one case of white atrophy of the disc, in a gentleman who had gone through a severe busi-

ness excitement, the head pains were always promptly relieved by it. In all cases, in which the fundus disease, whether of the choroid, retina or disc, could be traced to vaso-motor influence, the results have been most satisfactory."

### ZINCUM.

**Objective.**—Agglutination of the inner canthus in the morning, with a pressing sore feeling. Inflammation and redness of the conjunctiva of the right eye; suppuration in the inner canthus; the eyes are most painful in the evening and night, as from sand, with frequent lachrymation; even the upper lid, toward the inner canthus, is red and swollen. During the menses inflammation of the eyes.

**Subjective.**—Burning of the left lid, as is too dry. *Feeling of soreness in the inner canthi.* Soreness of the outer canthus, with biting pain. Pains at the root of the nose as if pressed into the head. Pressure on the margin of the left lower lid near the inner canthus. Painful pressure in the right inner canthus, with redness of the conjunctiva. Biting in the right inner canthus, relieved by rubbing. *Itching and sticking pain in the inner angles of the eyes,* with cloudiness of sight. Feeling of dryness in the eyeball. Constant burning in the eyes with feeling of dryness and pressure in them. Hot, scalding tears. Constant pressure in the left eye in the evening. Burning and biting, with photophobia of the eye, which waters, especially in the evening, and is agglutinated in the morning. Tickling in the right eye, as from dust, frequently. Sore, painful biting in the eyes towards evening, especially in the right eye. Violent itching of the left eye.

**Vision.**—Dimness of vision. A good deal of photophobia. Green rings before the eyes.

It is not infrequently called for in inflammation of the conjunctiva, especially if confined to the canthi—more particularly the internal—and accompanied by soreness, itching and sticking pains at the angles of the eye, with agglutination. It has also removed persistent redness of the conjunctiva remaining after pustular keratitis, without any discharge, worse toward evening and in the cool air.

For pterygium it is a valuable remedy, as several well marked cases have been cured. In one case, reported by Dr. Carroll Dun-

ham, the pterygium covered one-half of the pupil and was growing rapidly; there was much conjunctival injection, lachrymation in the evening, discharge and photophobia, especially by artificial light, pricking pain and soreness, worse in the inner angle and in the evening, but particularly marked was a sensation of *great pressure across the root of the nose* and supra-orbital region. Zincum cured.

The *sulphate of zinc* has sometimes been employed in place of the metal. "A case of dacryo-cysto-blenorrhœa; discharge profuse, muco-purulent, integument adjoining inner canthus red and inflamed, was entirely relieved by Zincum sulph.<sup>3</sup>."—A. WANSTALL.





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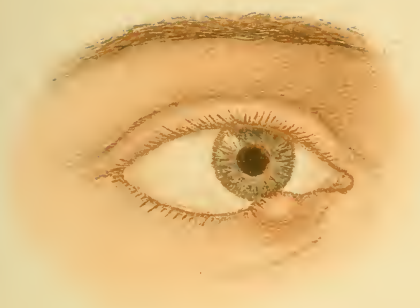
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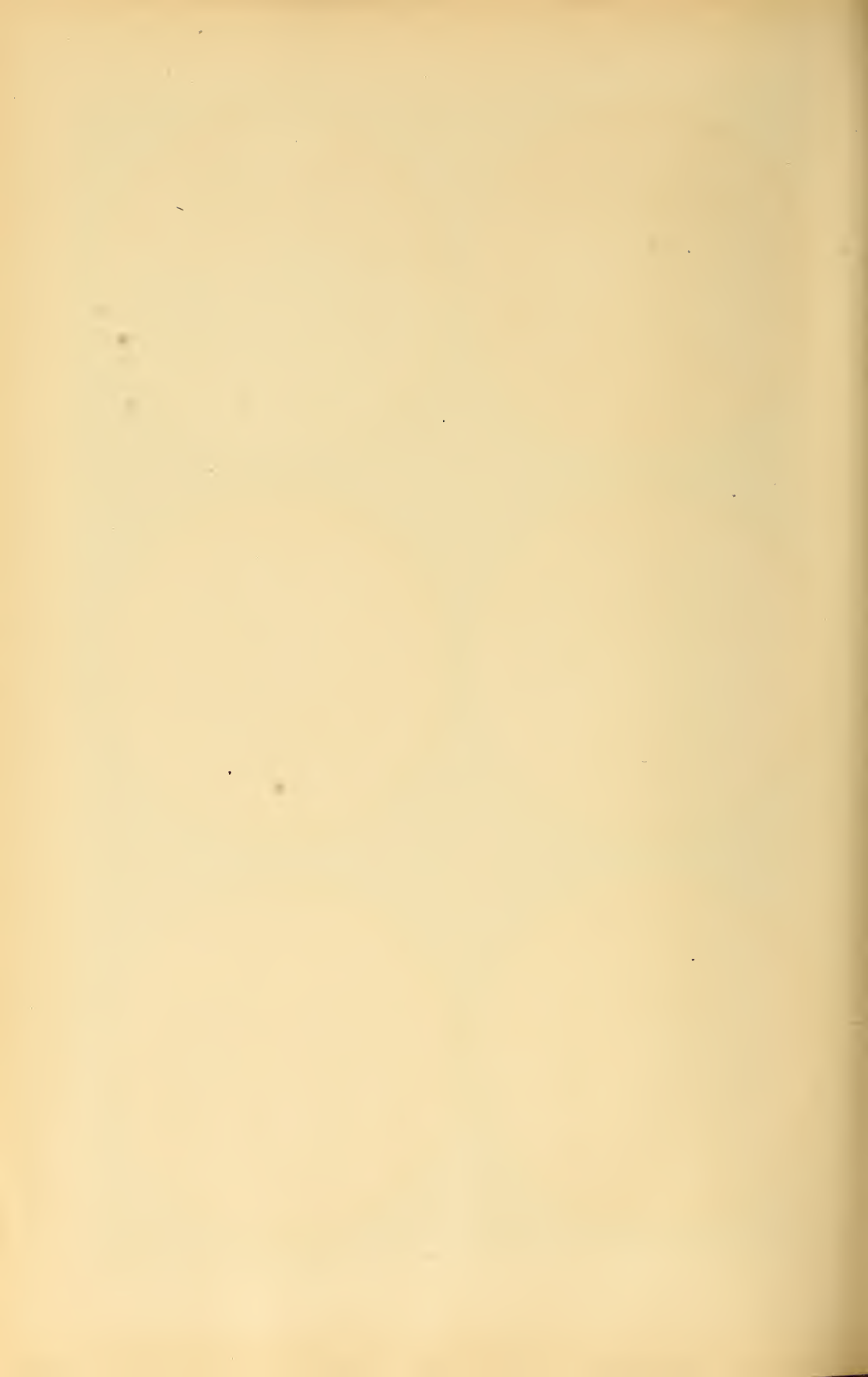
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